Rubber Journal and International Plastics

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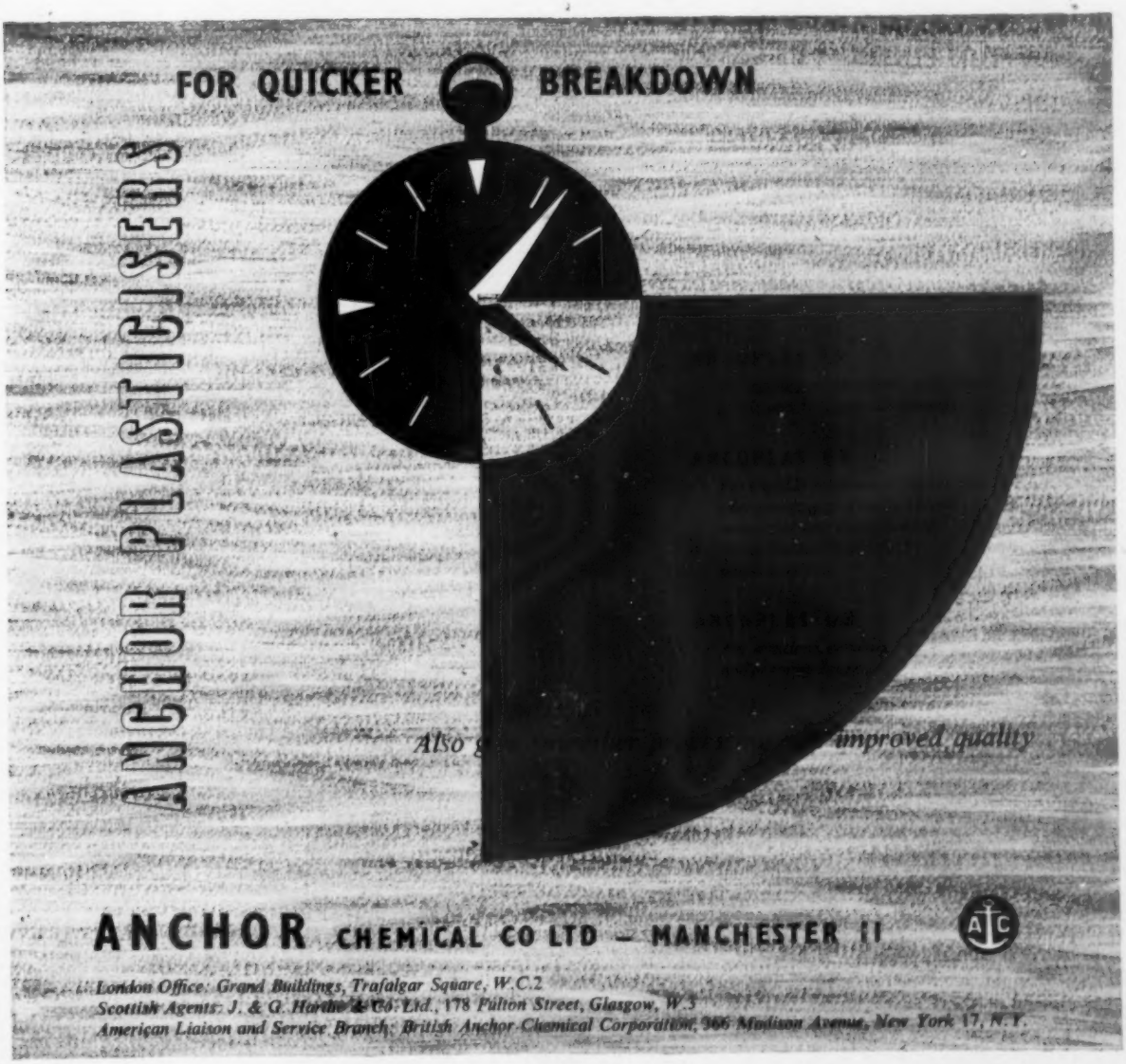
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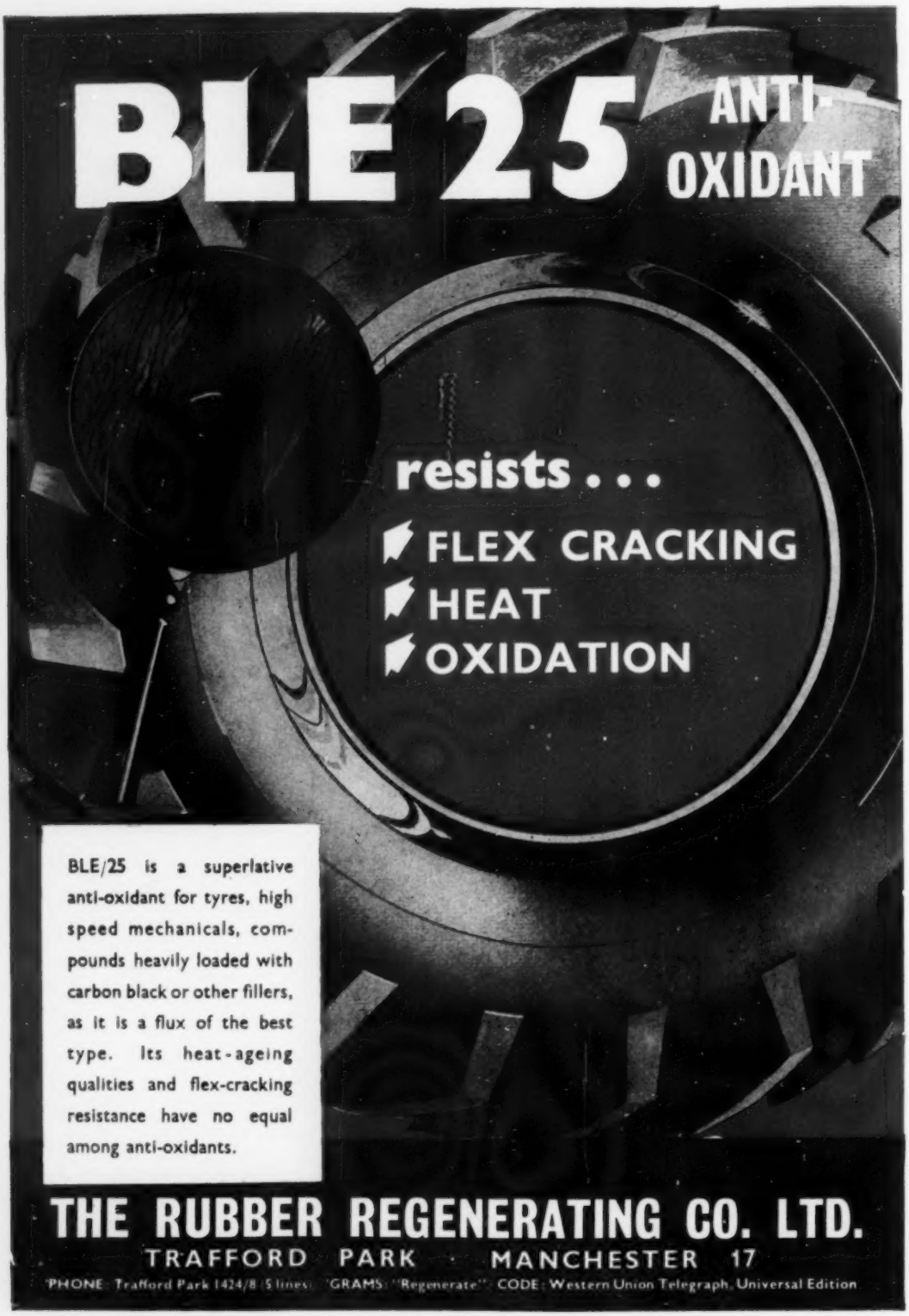

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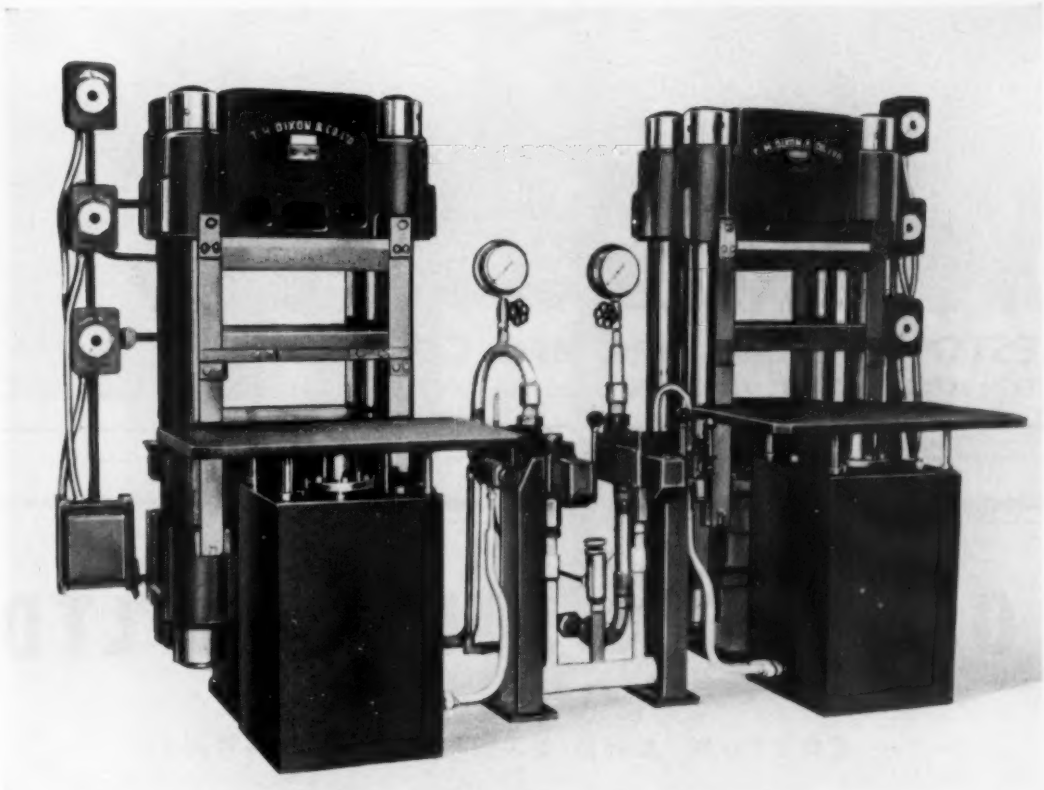

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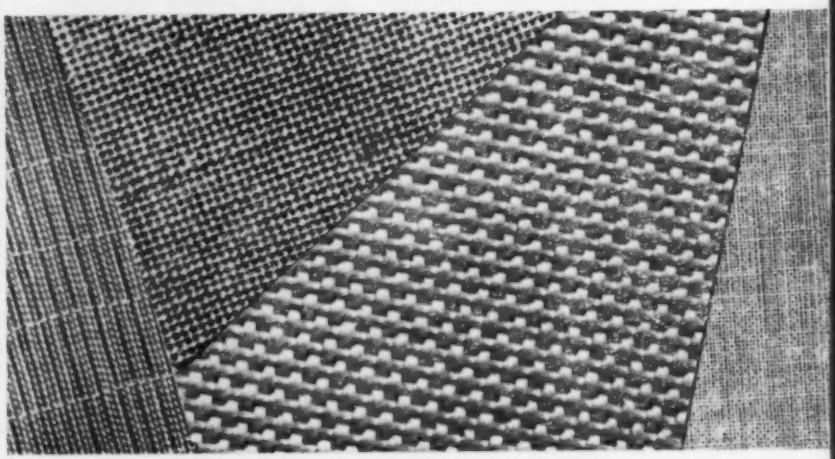

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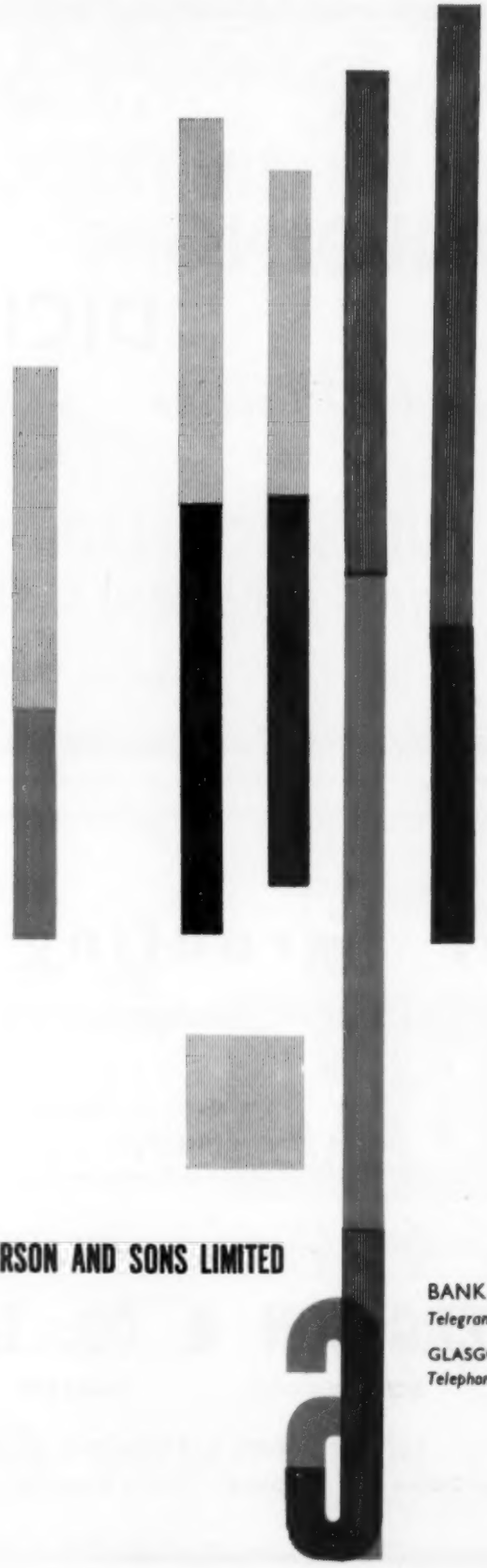

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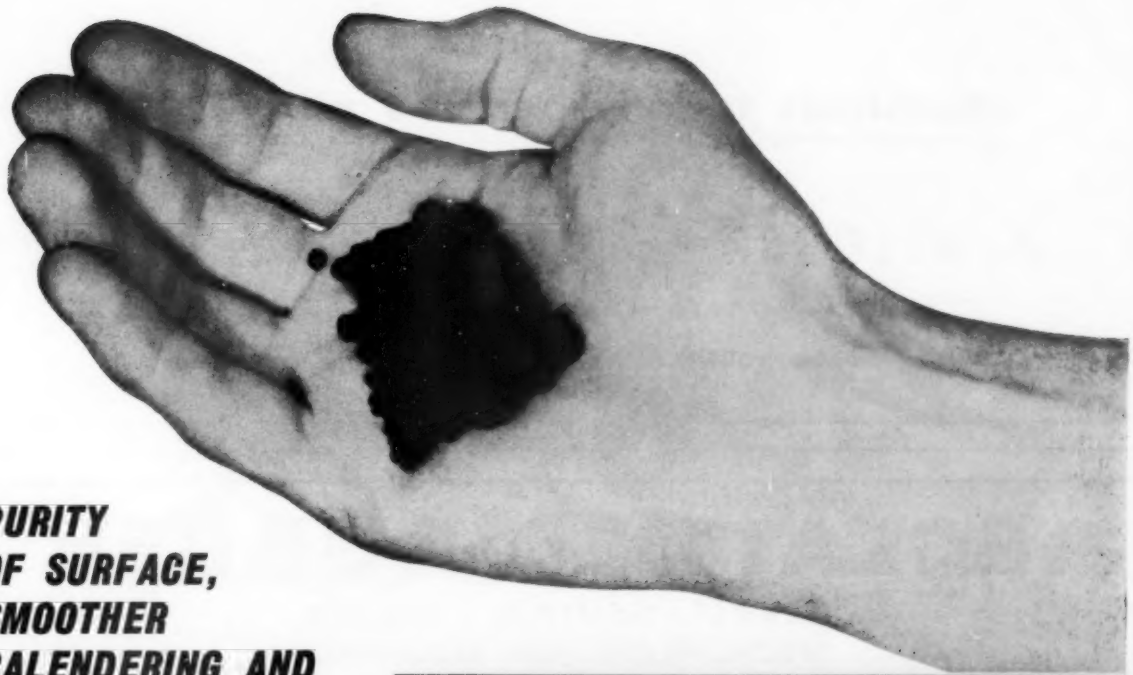

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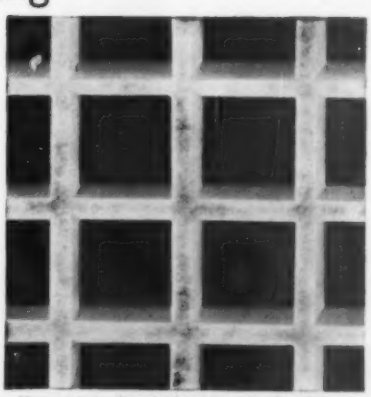

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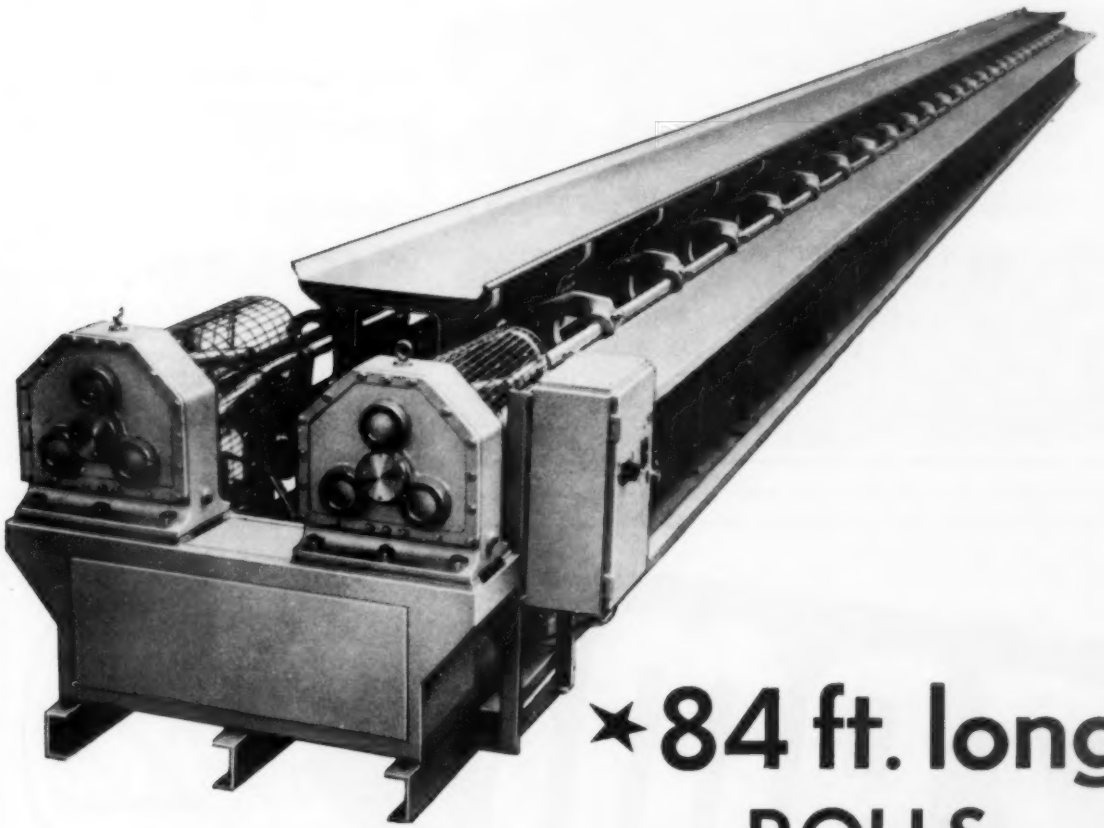

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Rubber Journal and International Plastics

Volume 138 **Price 1s. Post free 1s. 4d.** **No. 19**

IN ITS 76th YEAR

May 7 1960

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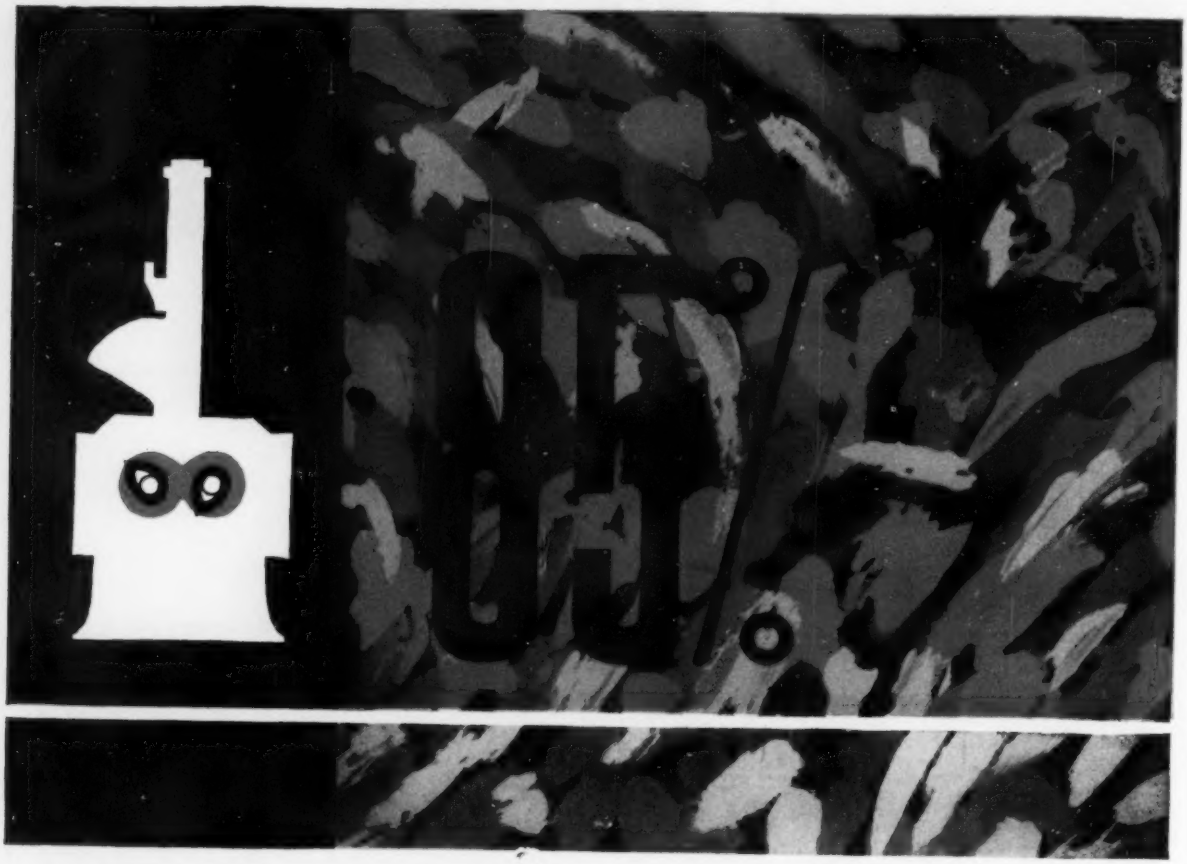

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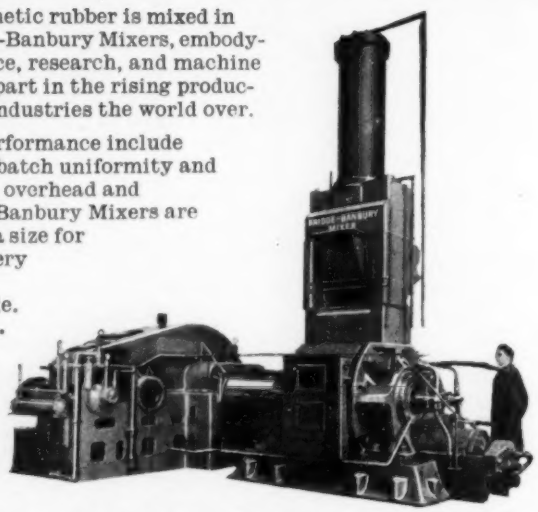

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NOTES of the WEEK

Growth Factor

SOME interesting figures about what he describes as the 'Polymer Industry' were given last week by Dr L. M. White, director of research and development for the United States Rubber Company. Dr White, who was referring to the industry in the USA, said that the polymer industry was now growing at about twice the rate of the gross national product.

The overall growth rate of the polymer business (in the USA) is about 6% per year, Dr White said. Among these polymers synthetic rubber is growing at a rate of 7.5%, plastics 8% and non-cellulosic synthetic fibres 11%. In 1959 American industry converted 2,000 million dollars worth of chemical raw materials into 4,000 million dollars worth of polymers such as synthetic rubber, fibre and plastic resins. These in turn were converted into an end product value of about 13,000 million dollars.

'The present volume of rubber, plastics and fibre production is estimated at more than 11,000 million lb. a year. On the basis of projected plant capacity expansion it is expected to increase by at least 500 million lb. per year,' Dr White predicted.

These are fascinating figures and they give some idea of the colossal potential for the 'polymer industry' in this country (scaled down proportionately). It will be remembered that the growth rate for sales of plastics materials in the UK during 1959 was 20% over the 1958 figure. Incidentally, the term used, 'The Polymer Industry,' is a neat one. The answer to the problem of a name for a joint rubber and plastics research association—avoiding the necessity for any argument as to which comes first in the title—could well be The Polymer Industry Research Association.

In and Out Up

PLASTICS and chemical elements and compounds made the biggest contribution to exports under the heading of chemicals for the first quarter of 1960, a rise of 14% over the first quarter of 1959. It is interesting to note UK exports, under all headings, to the Common Market countries increased by 19%, the largest increase both in absolute and percentage terms being to Western Germany, up 26%. Exports to EFTA countries increased by 20%. Re-exports were also up slightly; rubber showing among the main increases, mainly to Germany and France. Exports of plastics materials alone, at £3.8 million per month, showed an increase of 28% over the figures for the first quarter of 1959.

Due in part no doubt to the high price of natural rubber, imports of synthetic rubbers increased during the first quarter by 80% over the same period last year, both in quantity and value. Natural rubber imports cost 24% more but were less in quantity. At 6.6 million a month, imports of rubber were 33% up overall.

Now is the Time

THE increasing use made of the Plastics Institute by local government bodies, other professional societies and industry in general is evidence, if any is needed, that the importance of the Institute is growing rapidly. The necessity for all members to play a more active part in the affairs of the Institute is stressed in a notice to members sent out with the current issue of the *Transactions and Journal*. It is emphasized that at the present time the Institute's committees are not only inadequately manned but overloaded with work. Then, too, more demands and expanding activities make it desirable, indeed essential, to form more committees and working parties. The appeal, which requests members to notify their willingness to serve, state their qualifications and estimate how much they have to give of that increasingly rare commodity 'spare time,' states that engineers, in particular, are asked for their active help. Reading even the brief outline of the aspects of Institute activities in which it is hoped members will play a more active part, will bring home to many members the enormous amount which has to be done. Now indeed is the time to come to the aid of our Institute.

Bitterns in Fondu

AT the Royal Academy's summer show the sculpture varies from the conventional head to a fighting cat, a bittern, an armadillo, a red hog and several 'vultures for culture.' The materials worked in are as various: ciment fondu, bronze, Portland stone, aluminium, glazed terra-cotta, lignum vitae and sycamore woods—anything but plastics. A few sculptures are worked in cement reinforced with glass fibre, that is all.

This is not such a small point as it appears. There are an extraordinarily wide range of materials that artists could experiment with—giving good publicity for the industry. And it would do no harm to bring artists into contact with plastics; the fact that last year there were only eight entries for the Horners award shows that some such stimulation is needed from the design point of view.

NEWS *Briefs*

ALLIED DOUBLING MELAMINE OUTPUT—HONG KONG EXPORTS—MICHELIN'S ALGERIAN MOVE UK FACTORY FOR RUMANIA—NEW ENKA PLANT

●**Rumania**—Construction has started in Rumania of a British-equipped factory for the production of automobile tyres, the Yugoslavia news agency Tanjug reported on April 29. The factory, located near Bucharest, will be capable of producing about one million tyres a year and will be completed in 1962. Last year, Rumania bought equipment for the factory in Britain at a cost of more than $20m., Tanjug said.

●**United States**—Dow Corning Corp. have announced the foundation of a new scholarship worth 1,000 dollars a year for non-commercial contributions in the field of organosilicon chemistry.

●**Algeria** — Michelin is planning to build a 30m. new franc plant in Algeria. The project has already been accepted by the Algerian Industrialization Commission. Michelin has formed a company—Societe Africaine Michelin—which expects to produce 6,000 tons of tyres per year. The new company plans to meet Algerian requirements and subsequently to sell also to Tunisia and Morocco.

●**Israel**—The Alliance Tire Factory will increase its production from 7,500 to 12,500 tons a year with the completion of a I£5m. extension project within a year or so. Half of the investment in the new project will be in foreign currency. The number of employees will be doubled to 1,000.

●**Hong Kong** — Exports of plastics toys and dolls during 1959 totalled HK$75,190,000, and of rubber toys and dolls HK$260,000. For December 1959 alone, the figures were respectively HK$7,990,000 and HK$10,000.

●**United Kingdom**—Sales from the Board of Trade's stock of natural rubber in April totalled 7,212 tons for delivery as follows: spot 1,046 tons; May delivery 2,925 tons; June delivery 1,210 tons; July delivery 2,031 tons. 53,969 tons of rubber remained available for sale on May 1.

●**United States** — Allied Chemical has doubled facilities for making melamine and urea moulding compounds, although full-scale production of 90m. lb. will probably not be reached until the late 1960s. The company states that more than 90% of the output of all melamine resin is now used in the plastic dinnerware industry. The remainder is sold mainly for electrical fixtures and wiring devices. Urea compounds are used primarily for housing for electrical appliances, electric wiring devices, buttons, radio cabinets, and cosmetic closures.

●**Liberia**—The Salala Rubber Corp. (in which the Dutch concern N. V. Rubber Cultuur Mij., of Amsterdam, has a 75% interest), founded in Liberia as a joint venture with Nordmann, Rassmann and Co., Hamburg, obtained a concession covering about 100,000 acres, according to the RCMA 1959 report. This year, a start will be made with the plantation of 500 acres.

●**United States**—A plant has been authorized at Baton Rouge, La., to manufacture a new group of fluorocarbon plastics. First product planned is a non-flammable thermoplastic based on chlorotrifluoroethylene, which is expected to be available early in 1961, say Allied Chemical.

●**Malaya**—The inaugural meeting of the Rubber Association of Singapore and Malaya elected Tan Lark Sye as its first chairman. He is the first Chinese ever to hold office in a combined Malayan rubber organization.

●**United Kingdom** — British Enka have appointed Holland and Hannen and Cubitts (North West) to build their projected £1.6m. cellulosic film factory at Aintree, Liverpool. The factory is due to go into production early in 1961.

●**Australia** — Oldham and Son and Dunlop Rubber (Australia) have formed a jointly owned sales company called Dunlop Oldham (Pty.). It will market a double sleeve tubular battery for mechanical handling and other industrial uses.

●**United States**—Earnings of public companies during the first quarter of 1960 were 5% up on the corresponding period of 1959. Chemicals reflected the general trend (5% up), but rubber manufacturing earnings for the quarter were 3% down.

●**United States**—The Findlay, Ohio, and Fresno, California, polythene plants of Dow Chemical are now on stream. Dow expects the total market for polythene film to reach 650m. lb. a year by 1965.

'Busy day on the calender love?'—483

Shell Chemical's New Managing Director

Mr N. A. Iliff becomes managing director of Shell Chemical Co. on May 31 in succession to Mr L. H. Williams who has been managing director since 1955. Mr Williams is to take up a new executive appointment in Shell's International Chemical Organization.

N. A. ILIFF

Mr Iliff was educated at Oundle and King's College, Cambridge, where he was a scholar in Natural Sciences. He took first class honours in both parts of his Natural Science Tripos, being awarded a research studentship at King's in 1938. During the war he was in the Royal Engineers, serving in North Africa and Italy and reaching the rank of Lieutenant Colonel. He was mentioned in dispatches.

After the war he returned to Cambridge, his college having elected him to a Fellowship in 1942. He was King's College Lecturer in Chemistry and was also engaged on research. In 1948 he joined Shell Petroleum Company's chemical planning group and in 1950 spent a year working in Shell's chemical plants in the USA, mainly in Houston, Texas. In 1951, he returned to the UK and formed a long range planning group for chemicals. From 1955 to 1958 he was with Deutsche Shell, first as Chemical Adviser and subsequently as manager of their newly-created Chemical Industry Group. He returned to the UK in 1958 for a special organizational assignment in Chemical Industry Administration. In 1959 he joined Shell International Chemical Company on its formation as Regional Co-ordinator (UK, Caribbean, Central and South America, liaison with North America).

Economy Price Tyre

A new economy price tyre—the 'Marathon' is announced by Goodyear. It is said to be suitable for old vehicles. The company says 'it is a brand new tyre, fully covered by guarantee, with the All-Weather 'Self-Adjusting Tread,' 3-T cord carcass, and the smart appearance of higher priced tyres.'

Price is 15% below the standard All-Weather Rib. For example, a 4.50-17 'Marathon'—one of the most popular sizes for the 'old faithfuls'—costs 88s. 6d. The 'Marathon' will be made in six sizes: 5.00/5.25-16, 5.75/6.00-16, 4.75/5.00-17, 5.50-16, 4.50-17, 4.75/5.00-18.

PRESSURE TO EXTEND REPLANTING SCHEME

The Malaya section of the Rubber Growers' Association report refers to the Government replanting scheme which is due to end on June 30 1962. The Government so far has shown no intention to extend it and the Committee has asked the Rubber Producers Council to press the Government to renew the scheme.

The report notes that there is still no information as to what the Indonesian Government's final policy will be in regard to estate concession rights which have expired. Referring to the aid given to small planters by the Government of North Borneo, the report states that as a result of this aid, smallholders had by the end of 1959 newly planted some 40,000 acres with modern high-yielding rubber.

Ceylon shipped 23,204 tons of rubber to China in 1959, as compared with 23,640 tons in 1958 under their rubber/rice agreement. Production of rubber in Ceylon during 1959 amounted to 91,696 tons, compared with 100,196 tons in 1958. This was the lowest output since 1949.

Dunlop's Successful Associate

The International Synthetic Rubber Co., in which the Dunlop Rubber Co. has a 45% holding has been a complete success according to a statement made by Mr G. E. Beharrell, chairman of Dunlop, at a Press conference last week. A dividend of 4% tax free has been paid and annual output is estimated at 70,000 tons. Mr Beharrell's forecast last year that the use of synthetics by the company would increase proved to be correct, as the percentage of 39% compared with 36% last year showed. He said that this figure would increase further only if the output of heavy commercial vehicles increased more than that of cars and small vehicles. Output from the company's Nigerian estates is expected to start in 1963, increasing to a maximum in the late 60s, while replanting of the Malayan estates should, when completed, increase production by a third.

The 61st annual general meeting of the company will be held at the Piccadilly Hotel, London, on May 23 at 12 noon.

D. De Cuevas and C. Cuthbert have been appointed directors of the Leyland and Birmingham Rubber Co.

New Director of I.C.I. Nobel Division

Dr J. Bell, manager of the I.C.I. Nobel Division silicones department since May 1957, has been appointed to the Division Board in succession to Mr F. B. Wrightson, Engineering and Technical Director, who retired on April 30.

Dr Bell, who is 50, joined I.C.I. in its research department at Stevenston, Ayrshire, in 1936. After graduating at Imperial College, London, he remained there for six years, being awarded a Gas Light and Coke Company's research fellowship and then the Beit research fellowship. He graduated Ph.D. in 1934.

During the second world war, Dr Bell worked in the acids department, Ardeer, and in 1946 was a member of an I.C.I. mission to the USA for six months. On his return he joined the operating department, in which he became an assistant manager in 1953. A month later he was appointed acting assistant manager of Ardeer factory, Ayrshire, and in January 1954 became an assistant works manager of Ardeer, a post he held until taking charge of the silicones project.

Mr Wrightson, who has been Chief Engineer and Director of Nobel Division since 1952, first joined the company in 1929 at its Huddersfield works as a services and electrical engineer.

Tread Business Bought

Seiberling Rubber Co. of Canada Ltd., has purchased the tread rubber business of Gutta Percha and Rubber, Ltd., which closed down last week (*RJIP*, April 30, 669). The purchase includes all equipment, formulae, trade marks, inventories and accounts receivable. Seiberling will continue the manufacture of tread rubber under the Gutta Percha, dura tread formula.

Plastics in Cables

PART 2: PVC CABLES AND PROPERTIES

(Continued from April 30 issue, page 647)

By W. S. PENN, B.Sc.

WHAT properties have made PVC so popular in the cable industry? This article considers the special requirements of the cable industry, and the tests the industry has introduced to ensure that the characteristics are satisfactorily maintained.

One of the most important aspects of PVC to the cablemaker is the relative ease of processing. In general, PVC compounds are extremely easy to handle with quite a wide margin of safety for processing variations. Moreover, the finished product—although this is not absolutely essential—has a delightful appearance. This does not influence service conditions, but it certainly gives customer appeal, particularly when cables are sold over the counter of a suppliers store. Such an aspect cannot be considered here but the more tangible physical properties will be looked at. Processing will be considered in detail in Article No. 4.

Physical Properties

The types of PVC used in the cable industry are normally quite robust. Specifications from British and USA Standards (Table 1) indicate the level of tensile strength to be expected. The insulation grade is clearly the strongest of all and for heavy cables it is also used as sheathing. In practice, tensile strengths considerably in excess of this are normally obtained. The general purpose sheathing is adequate for most wiring purposes, but with arctic sheaths the position is rather different and this type of material is only used if really low temperature resistance is required.

TABLE 1
PHYSICAL PROPERTIES OF PVC

Material	*Minimum tensile strength, p.s.i.*	*Minimum elongation at break, %*
(1) BS 2746 general-purpose insulation	1,800	150
(2) BS 2746 hard grade insulation	2,700	125
(3) BS 2746 transparent flexible insulation ..	1,300	150
(4) BS 2746 general-purpose sheath	1,100	175
(5) BS 2746 Arctic sheath ..	900	150
(6) ASTM/NEMA PVC sheath ..	1,500	100

More important than tensile strength is tear resistance. Again this is very good—particularly in the case of the insulation compounds. The sheaths can certainly tear more easily and there are sometimes cases of this when electricians are stripping the ends of cables with a knife—this tearing probably reflects the comparatively poor but unmeasurable 'cut' resistance of PVC compounds.

In general however, PVC has been found to be perfectly adequate for most purposes. Its good abrasion resistance is well known, and coupled with its other mechanical properties this means that PVC is quite strong mechanically.

Low Temperature Properties

PVC has a definite limitation at the low end of the temperature scale. Most normal grades stiffen up considerably by 0°C. and below this are likely to shatter if struck sufficiently hard.

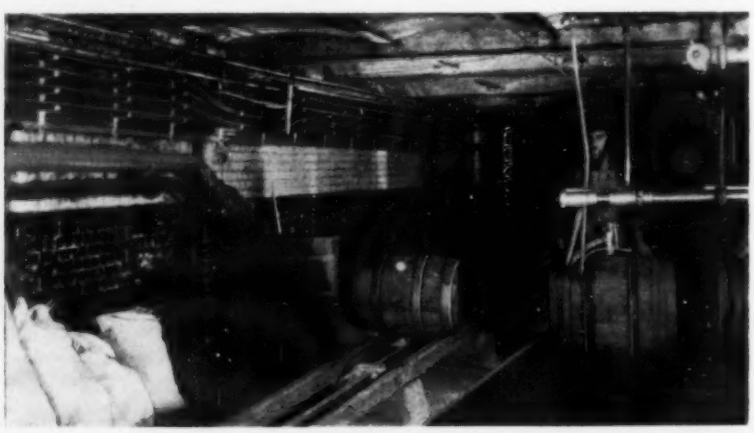
The test in BS 2746 is a bend test. In this the PVC core (comprising conductor and insulation) is cooled down to the test temperature (Table 2) in not less than two hours and not more than three. It is then wrapped round a mandrel which has a diameter four times that of the core and which has been cooled to the same temperature as the core. A sample is bent round the mandrel for three complete turns at a rate of one turn per second and the samples are required to show no sign of cracking. For general purpose insulation the test temperature is −20°C. and this may seem to throw doubt on the comments made above. But the test is unrealistic in the sense that it is possible to bend such cables at quite low temperatures provided sufficient care is taken and the rate of one turn per second is not particularly arduous. If the insulation is struck hard at this test temperature it is more than likely that it will shatter, even though it can be bent.

TABLE 2
COLD BEND TEMPERATURES FOR PVC (BS 2746)

Material	*Cold bend temperature, °C.*
(1) General-purpose sheath ..	−30
(2) Arctic sheath	−40
(3) General-purpose insulation	−20
(4) Hard grade insulation ..	−15
(5) Transparent flexible insulation	−20
(6) IPCEA sheath	−35

Troubles have been experienced when PVC has been used at low temperatures. Once installed it is satisfactory provided it is not struck, but it is normally recommended that the cable is not installed at a temperature below 0°C. One important commercial customer has introduced an empirical shatter test where the cable is cooled for several hours at −15°C. when a 7lb. weight is dropped on to it from a height of 5ft. Most insulations are very borderline on this type of test, which was introduced, incidentally, because one of the company's workmen once hit a cable with a hammer and shattered the sheath.

Nevertheless, in spite of these difficulties, no serious troubles have



Johnson and Phillips

Fig. 3. Use of PVC cables in a corrosive atmosphere

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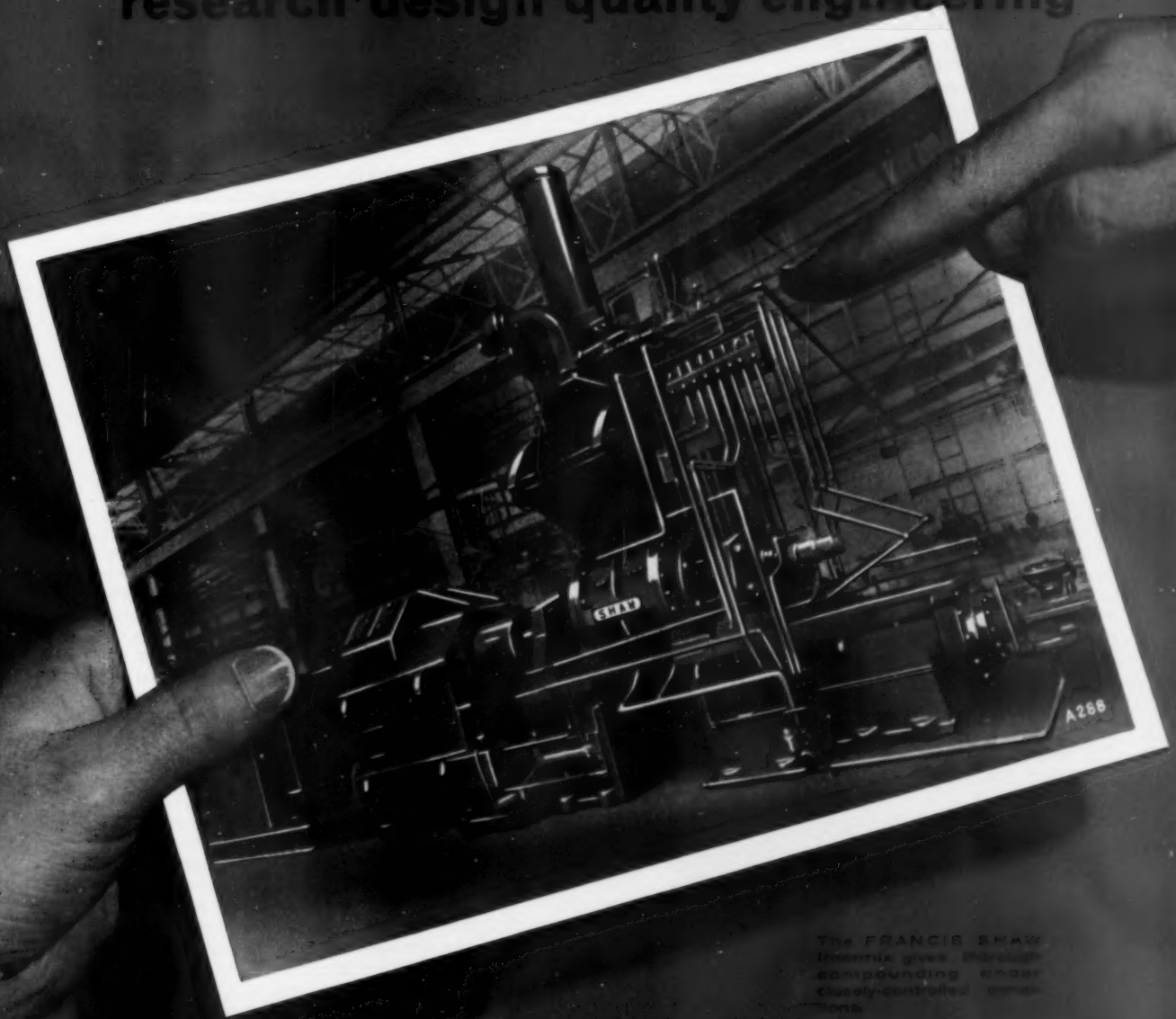

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P4377

been experienced with PVC provided simple precautions are observed.

Flame Resistance

One of the advantages of PVC—and in this respect it resembles neoprene—is that it does not propagate a flame. Both BS 2746 and the NCB specification P16455 call for flame resistance tests which consist essentially of applying a flame to a cable for a certain time, removing it and seeing how long it continues to burn afterwards. There is usually no difficulty in meeting this test, but obviously if too much inflammable plasticizer has been used, trouble could arise.

Weathering Resistance

PVC can have excellent weathering resistance provided certain elementary precautions are taken. There are many installations of PVC sheathed overhead wires both in this country and abroad including the Middle East with its extremely hot climate. Cablemakers are frequently told of temperatures up to 150°F. which makes it rather difficult for anything to exist, including PVC. Nevertheless, standard grades of PVC appear to be used quite successfully although it is preferable with large cables to protect any sharp bends from the direct rays of the sun.

Some disagreement exists over the relationship of the colour of the sheath to its ageing properties. It was thought for a long time that, as with polythene, it was necessary to have at least 2% carbon black in the mix for best ageing resistance. Although this is partly true, the black appears to be only marginally better and the coloured sheaths will certainly last for considerable periods even under the most arduous conditions.

Various specifications give different methods of studying the ageing characteristics of PVC compounds. BS 2746 (appendix B) has a 'Method of determining colour fastness to daylight exposure' which is based on exposing samples out-of-doors under specified conditions. In spite of considerable improvements in the resistance of PVC colours to fading, it is doubtful if any colours will resist for long the severe sunlight of the Middle East. DEF12B contains a complex climatic test, some details of which are given in Table 3. The value of this is probably doubtful, but, after all, it is an attempt to measure a very nebulous type of property.

TABLE 3

CLIMATIC TEST FOR PVC (DEF. 12B) (ABBREVIATED)

A helix of the cable is to be submitted to the following cycles:

Group 1

(1) Exposed to a dry heat of 85°C. for 16 hours.
(2) Exposed to a relative humidity of not less than 95% at a temperature of 55°C. for 16 hours.
(3) Exposed to a temperature of −40°C. for 2 hours.
(4) Again exposed to conditions of (2).

Group 2

A specimen is submitted to temperatures varying between 35 ± 2°C. and 20° ± 5°C., a few hours at each, with cyclic variations round each temperature. Each cycle is to last 24 hours, with the relative humidity 95%, the period of exposure being 84 days.

There are instruments on the market known as 'Weatherometers' which subject the specimens to alternate conditions of water and ultra-violet light. Although these have a certain comparative value it is extremely doubtful if the results obtained can be correlated in any way with service life.

Fig. 4. Four-core PVC mains cable for power distribution
Johnson and Phillips

Ageing Properties

The ageing properties of PVC can be measured in several ways. BS 2746 determines the maximum loss in weight on ageing, but the IPCEA specification has a change in elongation and tensile strength after an ageing period (Table 4).

TABLE 4

IPCEA/NEMA AGEING REQUIREMENTS

(1) After air ageing at 100°C. for 5 days:
  (*a*) Tensile strength to be at least 85% of unaged value.
  (*b*) Elongation to be at least 60% of unaged value.
(2) After oil immersion at 70°C. for 4 hours:
  (*a*) Tensile strength to be at least 85% of unaged value.
  (*b*) Elongation to be at least 85% of unaged value.

In BS 2746 the sample is weighed before and after ageing for 120 hours at 82.2°C. the loss being expressed as a percentage by weight of the original weight. There is some doubt about whether this gives comparable results between specimens of different surface areas, and there is a possibility that the specification may be changed to express weight loss per unit area.

Generally speaking, the ageing tests measure plasticizer loss, although ageing, at very high temperatures, can occur by polymer degradation.

Heat Resistance

Heat resistance is a complex subject and is of vital importance to the cable industry, and so it will be fully discussed in the next article. There are several types of ageing which must be kept in mind. First, there is the rate of change in properties when the PVC compounds are exposed to elevated temperatures. This aspect has already been covered. Second, there is the question of hot deformation which PVC undergoes at elevated temperatures (dealt with in the next article). Finally, there is the question of the heat shock test to check the resistance of the material to soldering and other service conditions, which aspect has already been considered. Therefore, in speaking of the heat resistance of PVC it is necessary to be quite clear on the specific aspect referred to.

Electrical Properties

The SIR of an average insulation stock is about 2×10^{14} ohm/cm which is lower than rubber at, say, 2×10^{15} ohm/cm. Again the power factor and dielectric constant (average values for insulation compounds) are quite high, which means severe power losses under certain conditions of power distribution.

It might be thought that these apparent poor electrical properties would severely limit the use of PVC in the electrical industry. That this is not the case is an indication that 'megohms' are not necessarily im-

portant in electrical installations. The breakdown strength of PVC insulation is quite high and this gives it a very high margin of safety for all electrical applications.

More important is probably the homogeneity of a PVC compound. In a butyl or natural rubber mix, even with the most advanced techniques, the dispersion is not always as it should be. This means that the effective thickness of a rubber or butyl insulation may not be more than half of the actual thickness because of inclusions of undispersed particles. In the case of PVC it is usually possible to rely on an absolutely homogeneous material so that the thickness put on the conductor is virtually the effective thickness. This means that thin wall insulations can be used and thicknesses down to 0.008in. are common.

Oil Resistance

Cablemakers are often asked what is the best material for sheathing for cables which have to have oil resistance. Their minds normally turn to PVC or PCP, although in many cases there is no reason why nitrile rubbers should not be used, but these have not found much favour in the cable industry.

At first it might be thought that PVC is extremely oil resistant. If a PVC sheathed cable, for example, is immersed in a mineral oil for a considerable period it will hardly swell at all and will remain perfectly flexible. From this point of view it does the job perfectly. But once the PVC is removed from the oil it rapidly becomes brittle. This is because the oil has leached out the plasticizer which it has replaced.

Whether or not, therefore, PVC is used in situations where oil is likely to be found is a question to be decided for each individual case. For total immersion PVC is obviously satisfactory. For occasional splashing with oil it is likely to be quite all right, but where it is likely to be subjected to frequent periodic immersions it is probably best not to use it.

Miscellaneous Properties

The water resistance of PVC is very good and considerably better than natural rubber. A typical insulation to BS 2746 gives a water absorption figure of about 8.0 mg./sq. in. whereas rubber is about 20 mg./sq. in. The figures for sheaths are somewhat greater than this in both cases and the arctic sheath is quite poor and is likely to give figures in the order of 60-70 mg./sq. in. Because of this PVC is being recommended for cables for direct burial in the ground. In the case of rubber cables these are normally protected from moisture ingress by conduits, but with PVC this is unnecessary.

Another important characteristic is ozone resistance. This is considerably better than most other materials including such well known ozone resistant products as butyl rubber and neoprene. This makes PVC very suitable for certain high voltage cables, although there are limitations from the electrical point of view, which will be taken up later.

PVC Applications Review

Some of the cables made from PVC are quite common types, but there are some newer developments which are of great interest and it is useful to review the applications of PVC in the cable industry.

A rough division is:

(a) Standard wiring cables to BS 2004.
(b) Miniature cables for Post Office telephones and various defence requirements (DEF. 12B).
(c) High voltage cables for which there is at present no British Standard.
(d) Power cables for mains distribution to replace paper cables.
(e) Miscellaneous cables of a wide variety of types where PVC might replace rubberlike materials or paper.
(f) Use as a serving over other types of cables, particularly those with paper insulation.

Standard Cables

The types involved here are those used for wiring houses and buildings, and flexible cords for certain equipment. Usually these have one, two or three conductors, PVC insulation and a PVC sheath overall to BS 2004.

An interesting point is the question of the use of tinned copper wire. It is probably unnecessary to use this from the strictly technical point of view, but the tin is retained mainly from the point of view of the electrician who makes the connexions. However, cases have been observed of interaction between the PVC and copper wire to form a thin film of a green copper salt.

This type of cable has become very popular indeed and is used in vast quantities. It has the merit of inflammability and superior moisture resistance and resistance to attack by many chemicals which has made it popular for direct burial in wall plaster. Few faults have developed with it, except when it has been misused by taking it near to hot spots.

Although appearance makes little difference to the technical merits of this type of cable, there is little doubt that the attractive appearance of PVC has contributed to its popularity. It can be made in the most attractive colours which can be incorporated into other colour schemes. A most attractive cable is the figure 8 twin with transparent PVC insulation. Although the strength of this leaves much to be desired, it is widely used without apparently any great difficulty.

Another type of standard wiring cable is the type which has replaced the old rubber insulated, braided and compounded types. There is an exactly analogous type with PVC insulation, but it is more normal to replace the braid with 0.010in. PVC, the resultant sheath being extruded in one operation with the PVC insulation. This type of cable is normally drawn into conduit and one interesting problem has been observed. If the cores are packed too tightly in the conduit and another PVC core is drawn in on top, the latter has been abraded right through to the conductor. What happens is that since PVC is a bad conductor of heat, the frictional heat developed when one core is pulled over another cannot be dissipated so that the insulation softens considerably and is then easily abraded through. The only solution to this problem is the use of proper installation techniques.

Miniature Cables

A large number of miniature cables are used for telephone purposes. Small conductors of the order of 0.020in. to 0.024in. are used with 0.008in. to 0.010in. insulation. The homogeneity of PVC ensures a satisfactory product which can be made at very high speeds with very few faults.

The ease with which PVC may be coloured is of great advantage here. Sometimes hundreds of pairs of conductors are included in the same cable and each pair has to be individually identified. At least 13 basic colours are used and on top of these will be spiralled one, two or even three colours in the form of stripes to give a further system of identification.

High Voltage Cables

If it was not for the high loss characteristics of PVC it would almost be an ideal material for high voltage cables. As it is, it is quite commonly used for 3.3 and 6.6kV cables and for shorter lengths of 11kV and even 22kV cables. Contrary to the case with polythene, very thick sections—up to 0.5in. for example—may be extruded without the formation of damaging voids.

The superior ozone resistance of PVC plays an important part in this

particular application. The next superior ozone resistant material used for high voltage cables is butyl rubber. It is now thought that this will require semi-conducting tapes over the conductor before the insulation is applied to avoid peak stresses, and consequently ionization and breakdown in the butyl rubber. PVC will probably not require this precaution, which makes it even more advantageous. Such cables too, with their excellent moisture and weathering resistance can be exposed to the elements or be buried direct in the ground.

Power Cables

Paper has been the king of all insulation for many years in the field of mains distribution of power—it has been employed in the bulk of cable used by the Electricity Boards. A decided chink however, has been made in the paper defences by the very serious field experiments with PVC insulation.

PVC as such is, of course, considerably more expensive than paper. But the PVC can be much more easily processed which offsets the cost and when the need for complex end terminations is removed, due to the high moisture resistance of the PVC, then the price difference between paper and PVC cables virtually disappears. Add to this the ease with which PVC cables may be handled (with regard to bending radii, for example), then there is little doubt that PVC will gradually make big inroads into the stronghold of paper insulation.

Miscellaneous Types

There is little point in making a list of cables which now use PVC, since most types are either using or considering using it. These types range from small cables for electric blankets through ignition cables for cars and up to many large cables used in coal mines, for dredging purposes and so on. Frequently, the change-over to PVC is made because it costs less than the equivalent rubber cable, but it is also often made on purely technical grounds where exceptional moisture and weathering resistance are important.

PVC Servings

Probably the largest volume of PVC goes into the servings of other cables. The old servings of hessian and bitumen, etc., over paper cables were first modified by the introduction of PVC tapes somewhere in the system and this was taken to its logical conclusion by the use of extruded PVC sheaths. These are certainly not necessarily the cheapest means of protection but they undoubtedly afford absolute insulation from corrosive influences which could otherwise attack the armour wire underneath.

PVC servings are naturally also used extensively over PVC and polythene insulated cables. In the former case if the PVC sheath is to be applied directly to the PVC insulation, the easiest way of guaranteeing absence of adhesion between the two is to use a sheath with a lower softening point than the insulation. Alternatively, such devices as covering the cables with talc or passing them through paraffin wax may be employed.

One final point about PVC sheaths. Cablemakers are often asked to apply a PVC sheath to a rubber insulation. While there is no difficulty in doing this—and in fact, it is frequently done—the insulation resistance of the rubber is quite rapidly affected by plasticizer migration. Fortunately, the insulation resistance of a rubber compound is fairly high in any case, so that the initial rapid drop does not seem to cause any undue difficulties in practice.

(To be continued)

FBRAM and Advertising

The Publicity Committee of the Federation of British Rubber and Allied Manufacturers has organized a course on advertising suitable for department heads on the sales side of firms who have to consider advertising budgets and, in the smaller-sized companies, discuss them with agents.

This course, which is to take place on May 30 and 31, will consist of a programme of lectures drawn up by the Advertising Association, and it will be held in the Council Room of the Institution of the Rubber Industry, 4, Kensington Palace Gardens, London, W.8.

Victor K. Kiam II has been appointed vice-president and general manager of Sarong Inc., which was acquired by the International Latex Corporation in February.

GSA SALES DROP

The General Services Administration announce that April sales of crude natural rubber from the US national stockpile totalled 3,651 long tons. This is far below the 10,073 long tons sold in March.

GSA said that approximately 86,500 tons had been authorized for sale by the end of the current fiscal year on June 30 1960, of which about 61,280 tons had been sold. GSA also announced that until further notice it will offer No. 1 RSS for sale on an optional basis. This is now effective. Under this option a purchaser can buy the rubber 'as is' at seven-eighths of a cent per lb. lower than the market price for No. 1 RSS at the time of sale basis fob car, New York City.

If the purchaser does not want to accept the price differential he can buy the rubber as he did in the past, with GSA and the buyer agreeing on the quality of the rubber when delivery is taken. 27,995 tons of No. 1 RSS will be offered for sale on the optional basis.

Sheffield to Heidelberg

Dr K. Jones, of Sheffield University has been awarded a CIBA fellowship in organic chemistry, which he will take up at Heidelberg University. The other organic chemistry award under the 1960/61 fellowships announced this month has gone to Miss P. M. Bryant, of Oxford University. She will go to Basle.

The CIBA Fellowship Trust was founded in 1947 and aims to further the exchange of ideas between scientists in the UK and on the Continent.

Belting Chairman

At the annual general meeting of the British Rubber and Plastics Belting Manufacturers' Association, held on April 27, David D. Marshall, of Greengate and Irwell, was re-elected chairman for 1960-61.

This lightweight polythene horticultural spray, made of high-density polythene, can develop a pressure of 200lb. p.s.i. and deliver a fine, penetrating spray. The container is blow-moulded by Lacrinoid Products in British Resin Product's Rigidex high-density polythene

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Polymer Industry at Hanover

RUBBER AND PLASTICS AT THE GERMAN INDUSTRIES FAIR

WITH 4,700 exhibitors, including some 800 from other countries, the German Industries Fair at Hanover, which closed last Wednesday, was larger than ever. The total exhibition area of more than 530,000 sq. yd. gives some idea of the size. The UK, with 95 exhibitors, was third among the foreign countries represented, behind France and Austria.

As far as quantity is concerned, the biggest display of plastics materials was in the construction of a host of stands throughout the 21 halls and the large open air area. The amount of polyester resin/glass, mostly curtain walling and toplights, plain and coloured, flat and corrugated, could probably have been measured in miles.

The spread of plastics into other industries was most strikingly demonstrated by the fact that members of the German plastics processing industry association were exhibiting in 15 out of the 21 halls, apart from the main plastics hall.

It was not to be expected, only six months after the Düsseldorf Plastics Exhibition, that there would be much that was new, although there were a number of machines, notably on the stands of Mapre and Johann Fischer, that were either not displayed or not ready for display at Düsseldorf. On the other hand there was an interesting show of machines for the rubber industry including mills, mixers, tyre building, vulcanizing and retreading machines.

A large and impressive four-roll calender for plastic film was exhibited on the Hermann Berstorff stand. The rolls, in S formation, of this machine are 31.2in. (800mm.) in diameter and have a length of 82in. (2150mm.). Two motors provide two working speeds, the first stage being 9-98ft./min. (3-30m./min.) and the second stage 26-260ft./min. (8-80m./min.). The calender is equipped with a roll bending device between the third and fourth rolls. The overall design is such that there is ample space beneath the rolls for embossing machinery. The rolls are provided with heating and cooling channels. Bias adjustment is fitted to the fourth bowl. Also on the Berstorff stand was a twin screw extruder for producing granule, profile and sheet designed for working on thermoplastics. The machine, the KD120, has been designed to work from powder, including PVC powder, and features, more particularly for the latter purpose, two conical screws which operate before the main screw. A further feature is the incorporation in the die head of two screws for the extrusion of sheet, again particularly PVC. These 'dispersion' screws are said to give a homogeneous flow of material throughout the width of the head without any overheating in the outer zones.

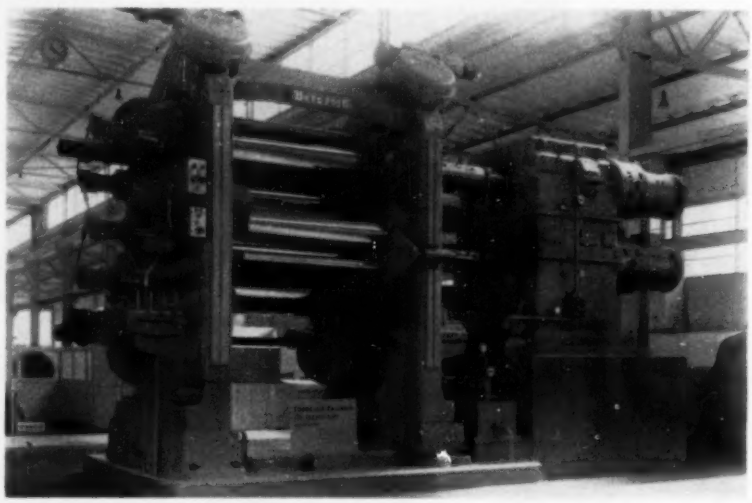


Fig. 1. Four-bowl S-type plastics calender on the Hermann Berstorff stand. 82in. face width by 31.2in. diameter

Fig. 2. Turbo-rapid mixer shown by Werner Pfleiderer. This will pre-gel and heat PVC and plasticizer to around 150 C. in 2-6 minutes

Aperture width is 58in. (1450mm.) and sheets from 0.02-0.2in. (0.5 to 5mm.) thickness can be produced. Screw diameter is 4.8in. (120mm.) and length diameter ratio is 20:1. Heating is by induction and output is given as from 440-550lb./hr. (200

Electrical Aids in Industry *Data Sheet* **No. 12**

Dielectric Heating - 3

Some further details of the uses to which dielectric heating can be put are given in this data sheet, being continued from data sheet No. 11.

The Woodworking Industry

A most important development in recent years in the woodworking industry has been the introduction of synthetic resin adhesives of the thermosetting type for the bonding and adhesion of wooden components.

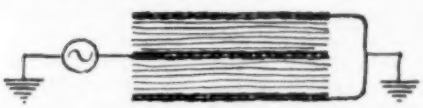
Setting of these resin adhesives proceeds at a rate largely determined by temperature. For instance, urea formaldehyde, one of the resins in common use, sets as follows:

TEMPERATURE	SETTING TIME
65°F	3 hours
80°F	1 hour
150°F	3 minutes
190°F	1 minute

The resultant bonded joint is equally satisfactory in each case. Most of the power supplied when dielectric heating is used is absorbed by the resin, the heat thus being concentrated where required and power consumption reduced to a minimum.

Plywood

With dielectric heating consuming power only during the heating cycle, plywood can be produced with considerable savings in heating times and costs.



For example, in a press holding 100 3-ply ¼" thick assemblies, the resin glue is set in 20 to 30 minutes, depending upon the dryness of the wood. An output of up to 60 cu. ft. of plywood is obtained per hour using a 25 kW H.F. generator.

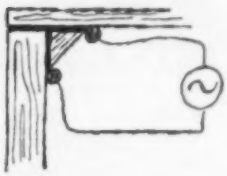
Curved Laminated Sections

Curved laminated sections are being increasingly used in contemporary furniture, and with dielectric heating rapid production can be achieved using wooden shaping blocks in single daylight presses. An alternative method of providing heat by conduction from heated metal strips becomes increasingly slower as the total section thickness rises above 0.05 inch, as shown below:

TOTAL THICKNESS OF LAMINATIONS	*Comparative heating times in minutes* CONDUCTION	DIELECTRIC
1 inch	20	4
⅜ inch	5½	2½
0.6 mm veneer	1	1½

Furniture Assembly

Because of the savings in glueing processes already instanced, dielectric heating is being extensively used in the furniture trade. It leads also to reductions in labour and floor space, with the elimination of assembly jigs. The heating equipment can be placed directly in the production line, cutting handling to a minimum.



Resin-bonded Wood Chipboard

A substitute for natural timber is made from wood waste and chippings, broken down to a coarse size, mixed with synthetic resin and heated under pressure. Dielectric heating gives quick and uniform heating, and increased fluidity reduces the power required for the final pressing and curing operation. In a continuous process, the length of the press required is also reduced.

Blockboard

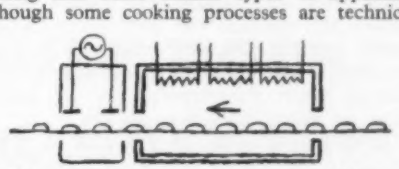
Production of blockboard by edge glueing strips of wood also provides an excellent use for dielectric heating, since considerable savings in time and labour can be effected owing to the large areas of glue line involved.

Other Resin-bonded Products

Dielectric heating is also used in the manufacture of other resin-bonded or impregnated products such as grinding wheels, impregnated woods, fabrics, felts, glass-fibre and similar products.

Foodstuffs

Increased use is being made of dielectric heating in many processes connected with foods; these include de-freezing and melting, sterilisation and disinfestation, drying of breakfast cereals, dog biscuits, rusks etc., heating of nuts to facilitate shelling and other similar types of application. Although some cooking processes are technically



possible, as for example bread baking, the 'unbrowned' product has so far proved unacceptable to the public and a completely dielectric process uneconomical. When combined with conventional baking, however, as now in the biscuit trade, where dielectric heating is being used to complete the baking of biscuits, it can produce normal biscuits in ⅓ to ¼ the usual baking time.

There are in fact so many potential applications of dielectric heating (and these applications are increasing daily as the chemical industry develops new products, as for example synthetic fibres) that the selection given in the present series of data sheets covers only a part of the whole field.

For further information get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available—"Induction and Dielectric Heating" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

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Advertisers Announcement

to 250kg./hr.). Drive is by 52kW DC motor.

New on the Werner Pfleiderer stand was a chip cooler, designed to work direct from a granulator. The process is continuous, the granules being air-cooled down to 60°C. Output is given as 440-550lb./hr. (200-250kg./hr.) based on hard PVC with a plasticizer content of up to 40%.

The cooler is used in conjunction with the Werner Pfleiderer PK 100/v. 'Plastificator' (described briefly in *RJIP* November 7 1959) shown for the first time at Düsseldorf, designed for the gelling and granulating of plasticized and unplasticized PVC. The machine will operate on powder and has an output capacity on rigid PVC of up to 220lb. (100kg./hr.) and on plasticized PVC of up to 530lb. (240kg./hr.). Operating power on continuous operation is 18kW.

From the agitation equipped feed hopper pre-mixed materials pass to feed screws and thence to a tapered rotor working in a similarly tapered barrel. The tapered rotor, or cone, is equipped with heating for start-up although when once working, the heat required for gellation of the polymer is adiabatic. Extrusion zone heating is by two heating shells governed by one thermocouple. Gellation in the cone screw section is claimed to take no more than 25 seconds with dwell time in the extruder screw section also very short. Because the machine will work on a rough pre-mix, no pre-gelling is necessary, although pre-gelled material boosts the output.

In the set-up exhibited, the extruder and the chip cooler were preceded operationally by a Turbo-rapid mixer, which was sufficiently large to feed two Plastificators (directly by gravity chute). With a net capacity of 22 gallons (100L) and will pre-gel and heat PVC and plasticizer to around 150°C. in 2-6 minutes depending upon the degree of gelling required. Pigment blending takes from 30-60 seconds according to the amount of pigment to be incorporated.

Notable on the Johann Fischer stand was an entirely new haul-off machine described as being instantly adjustable for a wide variety of profiles. Details are at the moment restricted owing to patent applications but briefly the machine consists of a continuous rubber band on which is mounted a steel band which in turn carries wooden elements. The bands pass between free running steel rollers, the upper ones being sprung and vertically adjustable independently and collectively.

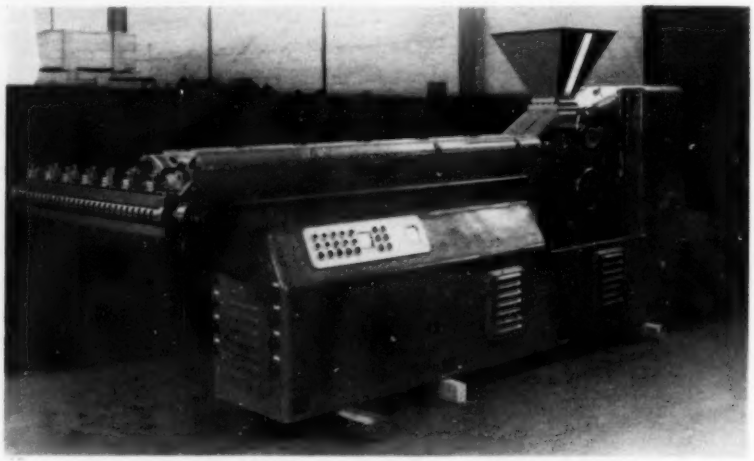

Fig. 3. Berstorff twin screw extruder, screw diameter 4.8in.

Another new machine on the stand, working from a 90/20D extruder —output, according to material and cross-section, from 77-330lb./hr. (35-150kg./hr.)—was a bottle or container blowing machine designed to produce containers of up to 44 gallons capacity (200L). Mould closing pressure is about 55 tons; the maximum mould dimension being 31in. (800mm.) width; 43in. (1,100mm.) height and 27 or 2 x 13¾in. (700 or 2 x 350mm.) depth.

This review of the German Industries Fair will be continued in next week's RJIP.

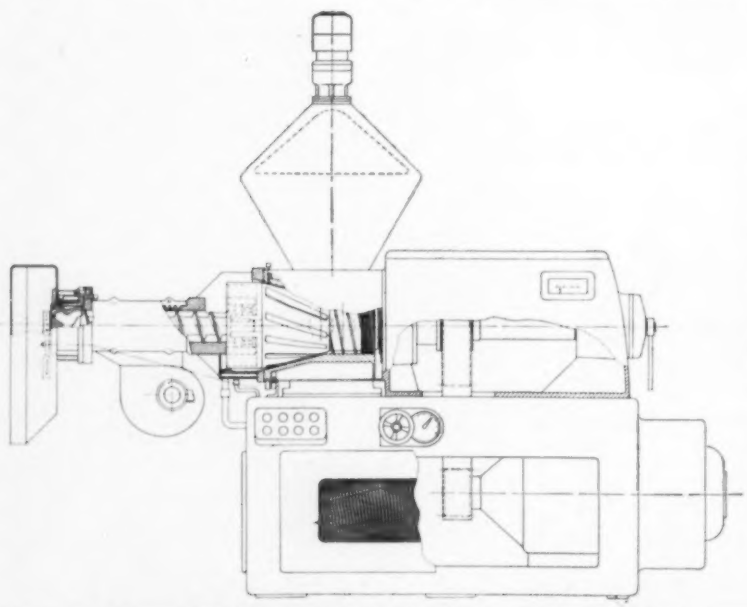

Fig. 4. The Werner Pfleiderer PK 100/v. Plastificator, designed for the gelling and granulating of plasticized and unplasticized PVC

Cumene Hydroperoxide

Distillers (who are sales agents for British Hydrocarbon) announce that they are now selling cumene hydroperoxide.

This can be used as a polymerization initiator and catalyst. In the polymerization of vinyl-type monomers, cumene hydroperoxide is claimed to be superior to other organic peroxides because of the wide temperature range (100°C. to −10°C.) over which it is effective. As a solution in organic solvents, or as the sodium salt in aqueous solution, it may be used either in homogeneous or in two - phase polymerization. An example of this latter is in redox systems such as the emulsion polymerization or co-polymerization of vinyl or diene monomers. Cumene hydroperoxide also finds application as a catalyst for curing polyester resins.

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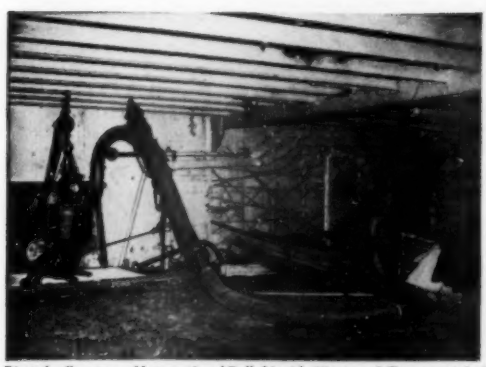

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COMPETITION IN CANADA

Nearly half of Canada's workers in the waterproof and canvas footwear industry have lost their jobs in the last 13 years as the result of imports from Asiatic and Communist countries according to Paul S. Smith, vice-president of Dominion Rubber Co. Ltd. Mr Smith was addressing a joint meeting of four Chambers of Commerce.

Mr Smith said immediate Government action was needed to save the industry 'from ultimate extinction under the avalanche of imports' from the low-wage countries. He described the state of the industry as 'profoundly depressing' but added that there was still hope that the industry would once again flourish, providing the required assistance was forthcoming from Ottawa. Canadian factories, he said, could not possibly meet the prices set by the foreign competition. Canadian wage rates, for example, varied from 92 cents to $1.99 an hour in the industry while the rates in Hong Kong were four to 15 cents an hour.

The industry, said Mr Smith, was not asking for complete exclusion of imports, 'but merely the reservation of a fair share of the domestic market for domestic production to keep Canadians employed at fair wages.'

P. B. Cow Take Over St. Helens

P. B. Cow and Co. announce that contracts are being drawn up to take over from British Insulated Callender's Cables at Slough, the premises and rubber manufacturing side of that company's subsidiary, St. Helens Cable and Rubber.

In order to improve the sales distribution of Li-Lo products the company say it is proposed to concentrate these activities at Slough, wherefor the lease of the Hay Hill premises has been sold.

It is also stated that negotiations for the sale of the entire capital of P. B. Cow's subsidiary, Elliot Equipment, to the Linen Thread Co. are now complete.

Keeping the Killer

It is reported from the US that sheets of polythene are being used to cover land while it is treated with methyl bromide. The chemical keeps down weeds and kills soil-pests. The plastics film keeps the fumes in the soil where they can do their job instead of going off into the air.

BPF's First Annual Dinner

CHAIRMAN URGES GREATER INTEREST IN OVERSEAS EXHIBITIONS

MR DAVID RADFORD, the chairman of the British Plastics Federation, speaking at the Federation's first annual dinner, urged members to give more attention to overseas exhibitions. He hoped that the Federation would be able to organize more combined displays of products as it did at Kunstoffe 1959.

The highly successful dinner, which replaced the luncheon held in previous years, was attended by more than 450 members and guests. It was held at the Dorchester on April 27.

Mr Radford continued that the Federation was particularly disappointed that it had been unable to raise sufficient interest from members to provide a combined stand at the Macroplastic Fair in Utrecht. The Federation continued to grow, he went on, and he recorded with satisfaction the rapid growth of the Reinforced Plastics Group which was now third largest with a membership of over 60 companies. To illustrate the growth of this side of the industry he said that in 1952 the Vickers Viscount aircraft 700 had 88 reinforced plastics components in its make-up. In 1956 the Viscount 800 had 715 components, while in 1959 the Vanguard had around 1,400, and it was estimated that in 1962 the V.C. 10 would have 2,000 such components.

It was expected that the newly launched P & O liner, the 'Canberra,' would contain no less than £500,000 worth of plastics when completed.

Frightening Competitor

Sir William Rushton Black, J.P., chairman of National Research and Development Corporation, said that 'almost imperceptibly' plastics were creeping into the motor car. Apart from facias, trim panels and instrument fittings, extruded sections and even gear wheels were being used. 'But in the engineering world you are still only on the fringe—although your rate of penetration is impressive . . . you are becoming a somewhat frightening competitor to the metal industries generally.'

But he uttered a word of warning. He said the industry should exercise care in the selection and proving of specialized materials. As the motor industry well knew, it was the failures that made the news—not the successes.

'Where do you go from here?' he asked. 'At the moment Great Britain is probably in the lead in the plastics field, but international competition will get fiercer. You must look ahead.'

The National Research Development Corporation had risk capital available, he said. It would advise on complicated international patent problems and was receptive to new ideas. It was willing to take part in joint ventures, either with individual companies, or collectively through any research association. But Sir William made one thing clear—if the venture was a success, the corporation wanted its pound of flesh.

'We take a risk with you; if the result is a flop we commiserate with each other; if a success we look for a handsome dividend.'

Looking further into the future he thought that the Hovercraft was 'right up the Federation's street.' The whole structure was ideal for reinforced plastics, quite apart from many supplementary items.

At the BPF annual dinner (*facing page, left to right*): **1. J. G. MacMahon (Board of Trade), R. A. Jones (Board of Trade). 2. Sir William Rushton Black, J.P. (Chairman, Nat. Research Development Corp.), David Radford (Chairman, BPF). 3. P. J. Gay (President, OCCA), E. J. Sangster (Sec., National Paint Federation). 4. E. A. Davis (Formica), Finlay Walls (I.C.I.), W. M. C. Norie (Past Chairman, BPF), D. G. Owen (I.C.I.). 5. W. C. Martin (James Ferguson), G. Rolfe (Prestwale), A. Golding (United Glass). 6. W. G. C. Backinsell (Spembly), B. Tutchener (Spembly). 7. J. Ratcliffe (Sec., PI), Dr M. G. Church (Ministry of Aviation). 8. H. W. Graesser-Thomas (Master of the Horners), T. F. Clarke (Clerk to the Horners), Sir William Garrett (Chairman, Assoc. of British Chemical Mnfrs.). 9. D. Jones (Ekco), J. R. Maitland (Ekco), G. O. Collier (Ekco). 10. H. W. Fender (Chairman, British Chemical Plant Mnfrs. Assoc.), G. Brearley (Director, Assoc. of British Chemical Mnfrs.). 11. H. G. W. Chichester-Miles (President, FBRAM), Dr W. F. Watson (Director, RABRM), R. P. Anderson (BPF Treasurer). 12. Basil Aldis (BPF), N. B. Punfield (Past Chairman, BPF), C. S. Dingley (Chairman, Trustees Plastics Industry Education Fund)**

British Plastics Federation

FIRST ANNUAL DINNER

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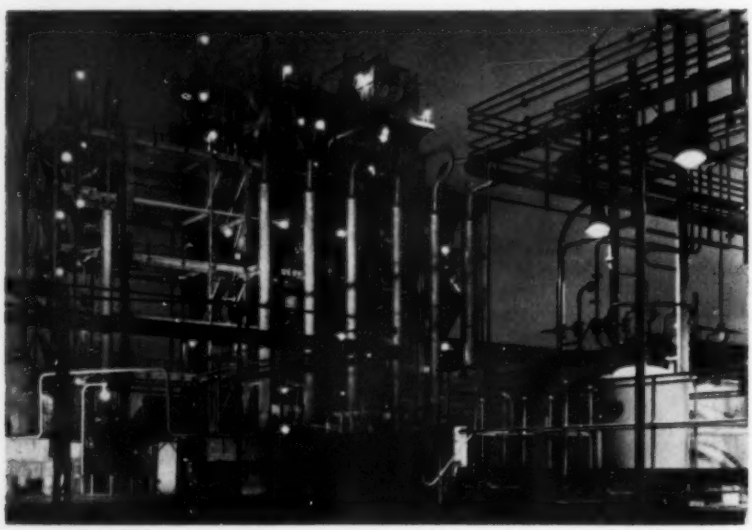
Midland Silicones, Ltd.

TEN YEARS OF ACHIEVEMENT

THE growth of Midland Silicones is remarkable, even in a section of industry accustomed to quick expansions. It is now only 10 years since Midland Silicones Ltd. was established at Barry, and the company now has a world-wide reputation. Three years were spent in adapting the site and production started in 1954, using plant designed on the basis of 'know-how' obtained from Dow Corning Corporation, the American associated company, who at that time had been manufacturing silicones for some years. The two firms have continued to work in close cooperation with each other and there has been a continual exchange of information. In fact the development work at Barry has progressed so well that Dow Corning are in many cases now working on 'know-how' obtained from their young cousins.



Distillation columns used for separation and purification of chlorosilanes

Wrong Forecast

The original forecasts of the demand for silicones, on which the output of the plant was based proved to be far too small, added to which an export demand (which has very recently been extended to include several iron curtain countries) was achieved which was also larger than had been envisaged and this entailed additions to the plant within a relatively short period of the start of production. An additional unit for the manufacture of methyl chlorosilanes was completed in 1955, and during 1956 and 1957 there were further minor additions to equipment to permit the manufacture of new types of materials. A major construction programme started in 1958 and is still in progress; the projects which have been completed include the rubber production building, the development pilot plant, and the first stage of the laboratory extension programme on which £250,000 has already been spent. Still under way are: a large new warehouse, a fluid production unit which will more than double the present capacity, and additional resin manufacturing capacity on a similar scale.

Technical Service

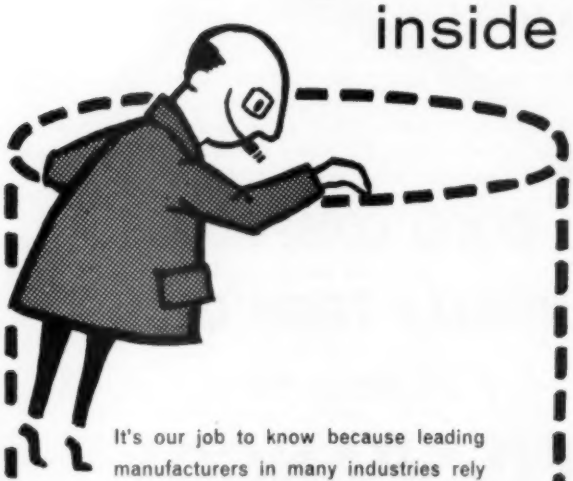
The company places great emphasis on the importance of the technical service department, not only for the direct benefit of users of the firm's products but also to work in very close cooperation with the process and product development department which is carrying out research to develop new products and improve existing ones, and similar development with regard to processes. To this end the two departments, or perhaps more correctly, these two sections of the technical service and development department are both housed in the magnificent new laboratory building already mentioned. Also working in conjunction with these is the development department pilot plant where all new processes can be tried out at gradually increasing scale from laboratory to what is almost a small production batch (up to 300 gallons can be handled) to iron out all the difficulties likely to arise from scaling up, this being well worth-while to avoid the possible loss of production batches which may be of several thousand pounds in value. Silicones are, as is well known, expensive materials and although there is no immediate prospect of a significant reduction in price, it is expected that development work will continue to increase the efficiency of the processes as used at present and perhaps reduce the number of stages in the production of a marketable material, thus offsetting the ever increasing production costs caused by higher wages, transport costs, etc. Over the past years this has been the case and in fact many of the company's products have been considerably reduced in price during the period.

Increasing Diversity

The industrial and domestic uses of silicones are numerous and seemingly growing rapidly, and there is still scope for many more as the variety and diversity of silicone materials being developed increases. They are available as mobile or viscous fluids, greases, elastomers, and resins, and the fields in which they are already finding numerous applications include: the electrical industry as insulating materials; the building and allied trades as water repellents for masonry and concrete, as paint bases and as bonding and moulding materials; the textile and paper industries, for surface treatments and coatings; and also as additives to polishes, antifoam agents, release emulsions and lubricants.

Midland Silicones Ltd., who justifiably claim to be 'First in British Silicones,' although they have been followed into the field by I.C.I., and Dow Corning compete in an almost world-wide market, which as previously mentioned has recently been extended to the iron curtain countries many of whom, including Russia who also manufacture silicones, have expressed interest in their products with particular reference to their uses as electrical insulators.

We know what goes on inside



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From Rubber Trees to Tyres

SEVEN PAPERS GIVEN AT THE FRANKFURT NATURAL RUBBER SYMPOSIUM

THE international rubber symposium organized by the German section of the 'Internationales Kautschukbüro' (IKD), held in Frankfurt on April 1 was most successful. The programme comprised seven invited lectures on a wide variety of subjects, ranging from rubber trees to tyres.

After an introduction by Mr H. M. Böhn, director of the IKD, and Prof. Wieland, Prof. Dr F. H. Müller, of Marburg University took over as chairman.

The opening lecture by Prof. Dr G. V. Schulz, Director of the Institute for Physical Chemistry of Mainz University, was on 'Recent investigations on size, shape and mobility of rubber molecules,' and dealt with sedimentation (ultracentrifuge), viscosity, light scattering and electron microscope studies carried out with rubber solutions. Most of the results referred to had been obtained with brominated rubber, which offers experimental advantages. The solubility of brominated rubber—in cyclohexane—decreased with increasing bromine content; at 41.5% bromination the solution was osmotically ideal so that the statistical theory became applicable to it.

The effect of steric hindrance on the end-to-end distance of the coiled molecules could then be estimated. Another advantage of bromination was that on evaporating rapidly a dilute solution, the molecules are precipitated separately as approximately spherical heaps observable under the electron microscope. The distribution functions of molecular size and weight could thus be directly determined. The mean figures agreed with those obtained by other methods.

Mineral Metabolism

M J. Le Bras, Scientific Inspector general of the Rubber Research Institutes, Institut Français du Caoutchouc, followed with a talk called 'Further Research Results on the Nutrition of Hevea Brasiliensis with Mineral Substances' in which he described work done in Indo-China on the mineral metabolism of Hevea. It had been possible to determine correlations between the concentration of certain elements both in the leaves and in the latex of the healthy, normal tree, he said. There was, for example, a strong positive correlation between the nitrogen, potassium and phosphorus levels; another important finding was the constancy of the potassium concentration in the serum.

Methods of working out deviations from the normal balance were described and instances quoted of cases where deficiencies discovered in this way were made good by controlled fertilization. The results were also illustrated by colour slides showing the effect of fertilization on colour and density of the foliage.

X-ray Investigation

Prof. Dr O. Kratky, Director of the Institute for Physical Chemistry of Graz University, spoke on 'X-ray Investigations of Rubber Solutions at Small Scattering Angles.' This work concerned the determination of the length of the so-called statistical chain element* and hence the degree of coiling of long-chain molecules. The method rested, he indicated, on the fact that the X-ray scattering was due both to random arrangement of the elements and to the elements themselves, but the two effects followed different laws and occurred in different angular regions. The transition from one regime to the other gave the length of the statistical chain element. The experimental difficulties were said to be considerable, and ways of overcoming them were described. In hexane solution, a value of 11.8 AU had been obtained; in di-isopropyl ether, a better solvent, a higher figure (15 to 20 AU) had been found, as was to be expected.

The morning session closed with Dr W. F. Watson, Director, RABRM, speaking 'On the Knowledge of Cold Mastication in Natural Rubber.' Degradation accompanying mastication at temperatures below about 95°C. was due to mechanical scission of the rubber chains because the shearing stress was sufficiently great to break homopolar bonds. Free radicals were produced, he said, and the main role of oxygen in the process was that of a radical acceptor preventing recombination of the chain ends. Many chemicals (peptizers) had the same effect. Free radicals were also instrumental in forming the primary bonds between rubber and active fillers necessary for a reinforcing action. An important application of the theory was the production of co-polymers by mastication of natural rubber in the presence of certain monomers as, for example, methyl methacrylate. The method was not confined to rubber but could be employed in the preparation of a wide variety of block polymers.

*The length of the statistical chain element, introduced by Kuhn, is such that if the appropriate number are joined at random, their end-to-end distance is equal to that of the actual molecule.

The afternoon session began with a talk by Prof. Dr W. Scheele, Director of the Rubber Institute of the Technical University of Hanover, 'On the Kinetics of the Decrease in Sulphur Concentration during Accelerated and Un-accelerated Vulcanization,' in which he reviewed the complexity of the results of these studies. There were serious discrepancies between the rate of sulphur combination during vulcanization as a function of the instantaneous sulphur concentration, and the dependence of the initial rate on the initial concentration. In unaccelerated vulcanization the two effects indicated reactions of different order (respectively 0.6th and 1st). In accelerated vulcanization, the rate of sulphur reaction could still be described as following a fractional power of the instantaneous concentration but this no longer held for the relation between initial rates and concentrations. Prof. Scheele discussed, with special references to accelerated systems, in how far the results could be accounted for by postulating intermediate products catalyzing the reaction.

Individuality

Prof. Dr Th. G. F. Schoon, Würzburg University lecture was called 'The Micromorphology of Natural Rubber and its Influence on Processing and Physical Properties of the Vulcanizates.' Examination of a great number of electron-micrographs had led to the conclusion that raw rubber and unfilled vulcanizates could be described as agglomerations of nearly spherical, deformable particles with a weight similar to the molecular weight as determined in solution. The rubber molecule thus seemed to preserve its individuality to a surprising extent, Professor Schoon said. Plasticization was seen as a separation of these deformable macro-molecules. During vulcanization, the molecules were

fixed with respect to each other by carbon-carbon or sulphur links, but at the same time cross-links were formed within the molecule and reduced its extensibility. Conclusions had been drawn from these premises on the abrasion process.

The last contribution, by Dr A. Schallamach, BRPRA, was on 'Recent Studies of Tyre Wear.' The sliding of slipping wheels, as exemplified by cornering or braked tyres, depended on the elastic properties of the wheel. This basic fact was demonstrated by means of a film showing the area of contact of a model wheel rolling with slip over a transparent track. Theoretical expressions had been derived from the amount of sliding, and hence abrasion, as function of the imposed conditions and of the elastic properties. It had been found in particular that abrasion increased with increasing resilience of the wheel. The experimental evidence agreed satisfactorily with the theoretical predictions and showed that differences in abrasion resistance proper could be outweighed by differences in resilience.

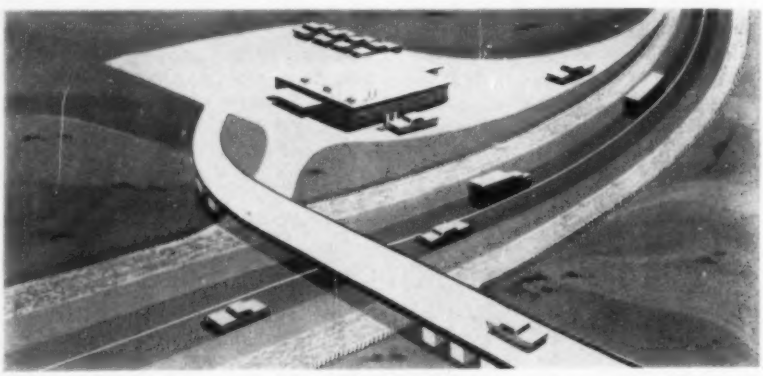
The meeting was organized in connexion with research contracts given to the Universities of Mainz and Graz by the Indonesian Rubber Institute Balai Penjelidikan dan Pemakaian Karet, Bogor, and with the co-operation of the Wirtschaftsverband der deutschen Kautschukindustrie and the Deutsche Kautschuk-Gesellschaft.

Nine Mile Tyre Test Track

THE world's largest high-speed tyre test track is being planned at Pecos, Texas, according to W. F. Billingsley, director of tyre development for the B. F. Goodrich Co.

Tyres must be tested at speeds considerably higher than legal speeds in order to make certain that ample safety factors have been built in for protection of the motorist, Mr Billingsley says. The B. F. Goodrich test track will be a 24ft. wide, two-lane roadway in a huge circle nine miles in circumference. It will accommodate 50 test cars and trucks operating at speeds of 70 to 90 miles an hour and could be used at speeds up to 150 miles an hour with a smaller number of vehicles in operation. It will have its own service facilities and will employ from 175 to 200.

A big track is needed, Goodrich say, to minimize the side thrust that results from travelling a circle at extremely high speeds. The excessive banking of the curves that would be necessary on a smaller track could make it difficult to get an accurate picture of a tyre's normal wear pattern. For the last 20 years road testing of B. F. Goodrich tyres has been conducted on public highways from a headquarters in Kerrville, Texas. In the future this work will be done on the new track.



Artist's impression of part of Goodrich's projected tyre track. The bridge in the foreground provides access to the office and service facilities inside the track circle

Tyres for passenger cars and trucks will be tested on the track on an around-the-clock basis throughout the year.

Work will begin on the track in June.

New Chairman for Plastics Institute

LONDON SECTION

AT the annual general meeting of the Plastics Institute, London Section, held on May 3 in the Wellcome Building, London, Dr F. P. Hiron, deputy manager of the Shell Chemical Company's Plastics Laboratory at Egham, Surrey, was elected new chairman of the Section. Mr Charles Oakhill was re-elected honorary secretary. Elected to the committee in place of retiring members (Dr John Gadsby, W. J. Marmion and V. H. Wentworth) were R. G. Pye (Borough Polytechnic), Dr W. G. Barb (Metal Box Co.) and T. C. Moorshead (Boake Roberts).

DR F. P. HIRON

In a short speech, the retiring chairman, Dr John Gadsby, reviewed the past year's activities. Membership, he said, was now at the highest ever figure of 1,473, which made the section easily the largest. He paid tribute to the work of the committee and congratulated them particularly on getting the speaker for that evening's meeting, Dr Akutin.

Dr Hiron said he was greatly honoured by his election as chairman. He was following a distinguished line of chairmen and would do his best to do as well as they had.

New Division

Refrigeration and General Engineers (Bramor Ltd.), of Walsall, Staffs., have recently opened a new division devoted entirely to plastics. It is specializing in turned parts worked in nylon, PVC and other materials.

Russian Speaker at PI Meeting

Dr M. S. Akutin, director of the Moscow Plastics Institute, was the speaker at the meeting on May 3 of the London Section of the Plastics Institute. His subject was 'Block and Graft Polymerization.' Dr Akutin's lecture which, as he did not consider his command of English sufficiently good, was read by Maurice Kaufman of the National College of Rubber Technology, was enthusiastically received. A report of the lecture will appear in next week's issue of *RJIP*.

Prior to Dr Akutin's lecture, the president of the Plastics Institute, Mr Harold Wilson, presented Fellowship, Associateship and Graduate certificates to those present who had gained them.

VIEWS and REVIEWS

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **Dr Schidrowitz**

The Rubber Puzzle

MY comment on the disappearance of the Rubber Sponge in certain areas have led me back for an explanation to the American technical Press.

My studies have gone back as far as the January 1960 issue of I/EC and the Review on Rubber by a well-known transatlantic publicist over the 1959 period. This is Mr William F. Tuley, a scientist on the staff of the Naugatuck Chemical Division of the United States Rubber Company. I will begin by quoting to get the background (p. 60A):

'An ethylene-propylene copolymer is getting considerable attention because of the low cost of the production. One European company has announced plans for commercial production. . . . The silicone and fluoro rubbers, noted for their heat and chemical resistance, have been extended in their application by some interesting new modifications. A substantial price reduction was made for one of these rubbers. Hypalon; a chlorosulphonated polythene is reported to have developed a substantial increase in use.

'The receding technical differences between the rubber and plastics industries are shown by the increasing use of polyurethane polymers in place of rubbers. 1959 consumption of polyurethane estimated at 75 million pounds, which is only about 2.2% of total rubber used. However, most of the polyurethane is going into foamed products such as upholstery, where it is making quite an impact on rubber foam. There are believed to be 25 to 30 producers of foamed polyurethane.

'Polyurethanes . . . are relatively expensive on a weight basis. *Low fabrication costs* bring the finished product costs closer to the cost of rubber.

'Solid polyurethanes may be rigid or elastic. As elastomers they may compare favourably with rubber in many properties. Early predictions of extensive use of polyurethane elastics in place of rubber have not yet materialized, but the rubber industry is giving these rubbers considerable attention to overcome *cost* and technical problems.'

It may be—I do not pretend to know—that for the 'small' man the cost advantage in manufacture, outweighs the broad disadvantages, and that this is the attraction. If so, why all this mumbo-jumbo?

Plastics in 1959

My delving in the I/EC records for 1959 having proved fruitful for rubber I thought that, perhaps, I should find a useful harvest under Plastics, and sure enough the matter under that heading (Vol. 52, No. 1, Jan. 1960—p. 39A) did not let me down. I only felt that I wished I had more room for the interesting monograph by E. L. Kropa and E. E. McSweeney (Battelle Memorial Institute, Ohio).

Critical Notes

The notes in this report have a critical flavour of some of the work accomplished in connexion with some of the high density linear polymers of polythene of which to date one has heard but little. One must not put too much weight on this aspect of things, but it tends to show that there is another side of the manufacture of which one has heard but little. Perhaps it is but the growing pains of a great industry, and accounts for the relatively slow progress which—or so it seems—has attended the progress of this branch of the industry. In any case too much must not be made of this aspect of things—but it has not obtruded itself, and rightly, on the scene.

Polythene

The report starts:

'Conventional polythene is setting new production records, with film representing about 38% of the sale. Nevertheless there are a number of clouds on the horizon (in USA). First with polyolefin plant projected abroad . . . the export market will be drastically curtailed.'

'The factor which counterbalances this gloomy forecast is the advantageous raw material picture of ethylene derived from natural gas rather than from factory cracking or from coal. Moreover, much of the new capacity revolves about the low pressure process which has not yet made major inroads into film production. Another variety of that which is making great strides economically is what is termed a medium density (0.935). Its important feature resides in the use of high pressure equipment and isopropyl peroxydicarbonate as catalyst. This catalyst has been known to polymerize ethylene for over ten years, but only now has real advantage been found in this procedure.'

High Density-Linear Polymers

The following seems to me remarkably interesting:

'Because the high density linear homopolymers are subject to stress cracking and to brittleness at low temperatures, current efforts are designed to copolymerize ethylene with other olefins such as propylene or butylene. . . . One potential market which is being explored and may turn out to be a temporary salvation for the high density product is a container for liquid detergents.

'Some of the major soap manufacturers are test-marketing such containers in a number of cities.

'Using the slogan "Misuse through reuse," the Society of the Plastics Industry, working with the National Safety Council, has devised a programme to educate the public concerning some of the plastic film.'

PHILIP SCHIDROWITZ

Oslo Plastics Congress

In connexion with the international plastics exhibition in Oslo (May 19-29) a congress has been arranged from May 23-24. Technical lectures on the following subjects will be given: 'Modern Trends in Plastics,' 'Acetal Resins (Poly-formaldehyde),' 'Poly-olefines,' 'Rigid PVC,' 'Polyester Resins,' 'Poly-amide Resins,' 'Stabilizers for PVC,' 'Mixing and Processing of Plastics,' 'Extruding of Plastics,' 'Injection Moulding of Plastics,' 'HD Polythene Pressure Tubes.'

Details from: International Plastics Congress, c/o Knut B. Anderson, P.O. Box 1204, Oslo.

MEN *and* MATTERS

A Review of People and Events

by George A. Greenwood

THE rate at which American companies who take part in international business are changing from simple export selling to overseas manufacture and marketing is increasing. The American in Europe had at one time a literary connotation: now he means business. Particularly when he's C. B. Branch, president of Dow Chemical International, who was in London last week.

At 45 this tanned, almost diffident, Nebraskan controls all international operations (excluding those in Canada and Mexico) for the Dow giant, which ranks among the world's five largest chemical producers. Under him, sales are building up quickly. Last year they shot up 18% to a record level; and half of them were in plastics.

Mr Branch has been connected with plastics ever since he came to Dow in 1937—he started on the research side on cellulose products—and he has the flexibility of mind that the industry seems to produce. This is reflected in his general policy. He says that Dow International will move in only where the company can make a unique contribution. An enterprise is good only insofar as it benefits the parties involved.

This isn't altruism, he told me. 'First and foremost,' he said, 'I'm responsible to my stockholders. But there has to be a true need for the products. Then everybody benefits.'

He illustrated Dow's approach by referring to the Dow polystyrene plant which is to go up in Greece. The country is underemployed, trying to become more industrialized and has passed legislation encouraging foreign investment. The Government was receptive, the opportunity there—and Dow have taken it.

On present form the company looks like taking a good many more.

Hot Water Bottle Record?

The tale of a rubber hot water bottle, by no means destitute of interest and romance, reached me recently when Mrs L. E. Chivers, who lives in Somerset, wrote saying that she wondered if this particular bottle, which she bought in October 1940 holds the record for longevity and good service. Mrs Chivers added that it has been in use every year since—and still is. She said, too, that in her view it has more than repaid the 7s. 6d. which she spent on it.

Naturally I was anxious as to who made it. Unfortunately, Mrs Chivers tells me that she cannot find a manufacturer's name on the bottle, but she has been kind and ingenious enough to send along a rough sketch of it with the markings, and it is just possible that from these rather tenuous bits of identification, somebody will come forward to spot the maker. It is made of reddish brown rubber, with broad vertical and horizontal divisions of a darker shade enclosing finer horizontal lines in panels. It is about 8in. wide, and has a length from the top of the neck to the bottom of 13½in. On one of the front panels are embossed the three words 'Best British Make.'

There are surely many people who share my curiosity about the firm which produced this paragon.

Chemstrand

Mr H. Hadden, it is announced, has been appointed a director of Chemstrand. He was already secretary to the Chemstrand Corporation in America, where, of course, he is probably better known than he is in this country (although he has many friends here). He was recently appointed vice-president and general manager of the Overseas Division of the Corporation.

G. F. Prescott, who has been appointed a director of British Resin Products

There are also two changes in De La Rue. Mr J. G. Barnes who is by no means unknown in plastics, has been appointed managing director of De La Rue Bull Machines, and Mr P. H. Balmer became secretary as from Monday last of the parent company, Thomas De La Rue and Co.

There has been an interesting take-over in the North. I am officially informed that Chiswick Products—a subsidiary of Reckitt and Colman Holdings—has acquired the whole of the issued capital of Kay Bros., of Stockport. This brings into the group Kay Bros. and its subsidiaries—Joshua Gibson, Kay Bros. (Ireland) and Kay Bros. Plastics.

Arrangements have also been made and are in process of completion for the company's subsidiary — Reckitt and Sons—to become the holder of a controlling interest in Vitax Ltd.

I.C.I. Changes

In addition, there are two items from I.C.I. This company is losing from its operations in the North the services of Mr Norman Landale of Lowcross Avenue, Hutton Gate, near Guisborough, Yorks., who has for the past six years been its education officer, although I presume that sooner or later it will have him back. Mr Landale has been appointed Director of Practical Training and Placement at the College of Engineering and Technology, Delhi. The appointment has been made under the technical co-operation scheme of the Colombo Plan, and is for two years.

There is news from the Dominion of the progress which is being made there by Canadian Industries Ltd., which, as you know, is an I.C.I. offshoot. Recently I.C.I. sent out to Montreal one of the English directors, Mr Peter Allen, to take over as president of CIL and latest reports are that it is doing considerably better than it was, now that it is under his direction. A comparatively young man—at 54—Mr Allen is a dynamic man of affairs with wide knowledge both of chemicals and textiles. At one time he was in charge of the synthetic fibre side of the group and its big build-up in Terylene at Wilton was under his care. In Canada, however, he is, I gather, more interested in chemicals, and the

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Some New Appointments

Among numerous changes which have been announced since I last wrote is an interesting one within that well known company of Albright and Wilson, the chemical manufacturers who are so closely associated with both rubber and plastics. Mr Bryan Topley has become deputy chairman, after an association with the company stretching over 24 years throughout 16 of which, he has been a member of the Board.

Mr Topley, a Londoner in his 50's was in his early years on the theoretical side. He spent five of them at the University of Leeds as lecturer and reader in physical chemistry, after which he had a spell on the staff of University College, London, before going to Princeton for a year, with a Rockefeller Foundation Fellowship. He came back to join University College for a year or two and it was afterwards that he became associated with Albright and Wilson, going to its Research Department at Oldbury, near Birmingham. He has been with the company ever since, and within that period he has made a host of friends, because not only has he great practical knowledge of chemicals and the associated industries, but he is also a man of great charm and cordiality. He lives at Checkendon, in the Chilterns, and is married, with two children both of whom are in turn married, and have made him into a proud grandfather.

Turned Parts

Bramor Ltd., of Walsall have opened a new division devoted entirely to the production of plastics turned parts in Tufnol, Casein, PVC and other materials. This enterprise is under the supervision of Mr H. Fowkes who was for some years in charge of F. H. Goldsby Ltd., of Birmingham. Mr Fowkes has a long experience in machining plastics and is quickly forming a very efficient unit at Bramor.

Neoprene Head

Dr Rudolf Pariser, of the Elastomer Chemicals Department of E. I. du Pont de Nemours and Co., presented a paper on recent studies in the cross-linking of neoprene type W and 'Viton' A synthetic rubbers at a meeting of the German Chemical Society in Bad Nauheim held on May 2 and 3. During his stay in Europe, Dr Pariser is also speaking to the French Rubber Institute in Paris and will visit rubber research organizations in the United Kingdom.

Born in China of a German father, Dr Pariser went to the US in 1941 and enrolled at the University of California where he graduated in chemistry. Following two years in the US Army, he carried out post-graduate work at the University of Minnesota and majored in physical chemistry. He joined Du Pont's Organic Chemicals Department where he is now Division Head in charge of neoprene research at the Department's laboratories in Wilmington, Delaware.

41 Years in Rubber

Harold D. Tompkins, a vice-president of the Firestone Tyre and Rubber Co., Akron, has died unexpectedly in Boston, Mass. A 41-year veteran with Firestone, Mr Tompkins joined the company as a general line salesman and became vice-president in charge of trade sales in 1941. He remained in that position until 1957 and then continued as a vice-president of the company.

Mr W. S. Penn

Mr W. S. Penn, until recently head of development and research on rubber and plastics cables with Johnson and Phillips, has taken up the appointment of production manager of the rubber and plastics departments of Richard Klinger Ltd., Sidcup.

Mr Penn has for many years contributed to *RJIP*. His articles have included 'Variability of Polymers,' July 22 1950, a series 'Synthetic Rubber in Cables,' August 22 1959, and he is the author of the current series 'Plastics in Cables,' Part II of which appears in this issue.

Question Corner—116

(Second Series)

441. What controls are absolutely necessary when coating wire for electrical applications?

(Answer next week)

Answer to Question Corner—115

440. Film impact strength, or resistance to shock impact, is not the same as film tear strength. Impact strength must be high for a number of applications, such as packaging, and is a measure of toughness of the film.

Higher polymer density lowers this property and one of lower density is preferred for many applications where it is important.

There are several methods of determining the property and one is known as the 'bag drop test.' A polythene bag is filled with a specified amount of sand, or other material, and dropped from a specified height on to a smooth, hard surface. The maximum height at which the bag will sustain three successive drops without bursting serves as a measure of film impact strength. The test is empirical but useful.

Another test which is more accurate is the 'dart drop test' (Plast. Tech. March 1956, 151) where, instead of dropping a filled bag, a dart is dropped on to a clamped, tightly held polythene sheet. The dart is a 1½in. phenolic plastic hemisphere at the end of a short rod. The rod can be loaded with different weights. The dart is dropped on four sets of ten specimens each. Each set is subjected to increasing heavier weights. The 50% failure point for the sample is determined by plotting the percentage failure of each set against the weight in grams.

(Another question next week)

Polly Ester Says . . .

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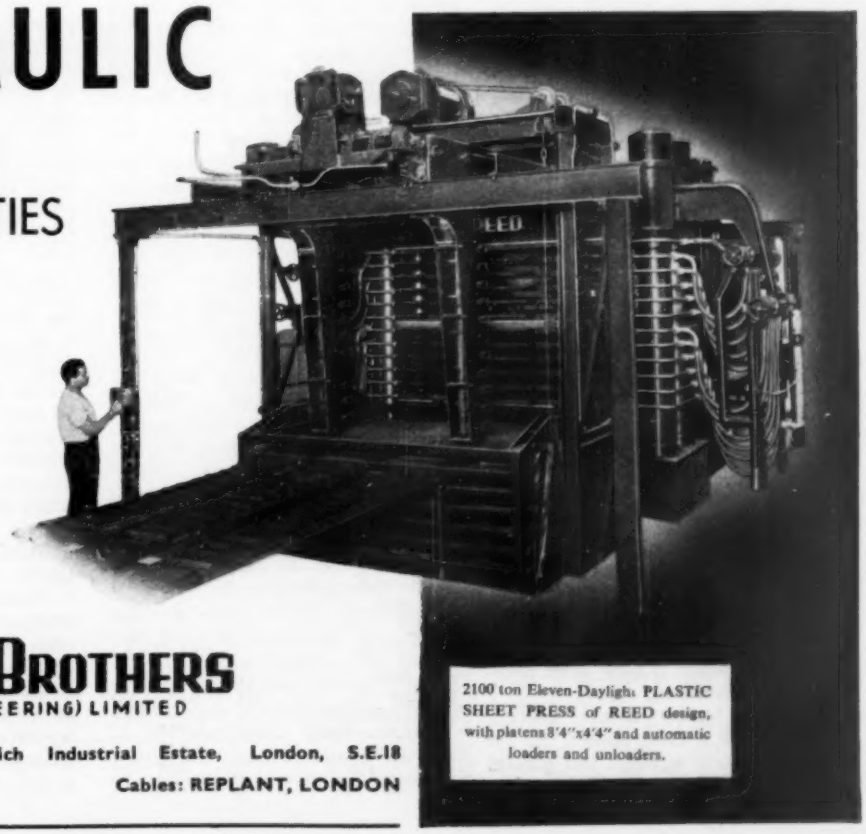

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Carbon Blacks in Various Polymers

BEHAVIOUR OF DIFFERENT TYPES

(Concluded from April 30 issue, page 655)

By N. C. H. HUMPHREYS, F.I.R.I.

A NUMBER of grades of butyl rubber varying in degree of unsaturation are marketed. Molecular weights also vary and certain grades are non-staining, a very important point when designing automobile sealing strip for doors, windows, etc. Broadly speaking, the less unsaturation in the copolymer the greater the heat and ozone resistance and general inertness to chemical attack but also the slower the vulcanizing characteristics. Extremely low unsaturation butyl needs to be cross linked by means of more active agents than does natural rubber, but medium and high unsaturation butyl can be efficiently vulcanized with conventional natural rubber accelerators and sulphur. When service conditions allow it is obviously preferable to use a polymer which can be cross linked with conventional natural rubber vulcanizing agents because the quinoid systems are not easily processed and dispersion of red lead is often unsatisfactory. Examples of these two vulcanization systems are shown in Table 6.

TABLE 6

Butyl (high unsaturation)	100	—
Butyl (low unsaturation)	—	100
Zinc oxide	5	5
Sulphur	1.5	1.5
MBT	0.5	—
TMT	0.75	—
Selenium - diethyl - dithiocarbamate	0.75	—
Dibenzoyl - p - quinone - dioxime	—	10
Red lead	—	10

The latest development in butyl vulcanization is the so called 'resin cure' patented by the US Rubber Co. whereby cross linking is effected by means of phenol formaldehyde resins (*e.g.* Amberol ST 137) and the resultant vulcanizates are said to have phenomenol heat resistance and good compression set. This process can only be used under licence.

With all these curing systems it is possible to use a wide variety of carbon blacks, although the quinoid compounds are sensitive to pH and furnace blacks are specially recommended in such cases in order to obtain safer processing, a feature quite the opposite to most other polymers and vulcanizing agents.

For the highest tensile strength channel black is often quoted, but for the highest tear strength and general performance in such exacting applications as tyre curing bags SAF is probably the best choice. A heavy duty formula of this class is shown in Table 7.

TABLE 7

Butyl (medium unsaturation)	100
SBR 1500	10
SAF black	55
Zinc oxide	5
P-quinone-dioxime	2
Red lead	8
Forum 40 oil	8
Sulphur	2

It is worth bearing in mind that FEF black exerts a profound effect in 'killing the nerve' of the polymer and either alone or blended with other blacks, is a most valuable ingredient in butyl formulations.

Other Elastomers

Polysulphides, polyurethanes, vinyl-pyridines, modified nitriles containing carboxylic groups etc., can be compounded with various blacks but, generally speaking, FEF is the preferred type because it has the property of imparting good processing characteristics to many otherwise nervy and difficult polymers. Some examples of these more unusual rubbers compounded with FEF black are given in Tables 8-11.

TABLE 8

Thiokol FA	100
Zinc oxide	10
Stearic acid	1
MBTS	0.3
DPG	0.1
FEF black	40
TS	1,300
% EB	550
H	60

TABLE 9

Genthane S	100
Stearic acid	0.25
FEF black	45
Di-cumyl-peroxide	1.6
TS	2,800
EB	600
H	52

TABLE 10

Copolymer (vinyl pyridine 25, butadiene 75)	100
Stearic acid	1.5
Zinc oxide	5
MBTS	3
TMT	2
PBN	3
FEF black	50
Sulphur	0.15
Benzotrichloride	15
M at 300%	1,750
TS	1,900
% EB	320
H	52

TABLE 11

Hycar 1072	100
Zinc oxide	5
Stearic acid	1.5
FEF black	45
Di-octyl-phthalate	12
Di-octyl-sebacate	12
TMT	3.5
TS	2,400
% EB	450
H	60

Polyurethanes capable of being vulcanized with sulphur and conventional accelerators are also known, for example Adiprene C.

Some General Considerations

The modern rubber technologist has a very difficult task before him when considering how best to choose a carbon black for any specific compound of high performance because blacks no longer fall into clearly defined positions. For example, SAF black is not much superior to ISAF in laboratory tear and abrasion tests in a tyre tread compound, but exhaustive road tests will certainly show the advantage of SAF. The yield of black from the raw material almost invariably drops faster than reinforcing effect increases, thus it is generally unproductive to search for a blend of blacks which will be cheaper and better than a single black. This does not mean blends of blacks have no value, but it does mean that, at least in the highest reinforcing range, a blend of better with poorer black which matches an intermediate black will have increased material cost. This point applies particularly to the high performance blacks which are the subject of this paper.

Blends of carbon black with highly reinforcing light coloured fillers are useful when high electrical insulation is required but for general purposes the light coloured reinforcing agents do not equal carbon blacks in reinforcement. One case where a deep black is used with a light coloured filler is in black footwear, where such a blend minimizes marking of floors, etc.

Physical tests show that the highest reinforcement is generally associated with the highest hysteresis loss. If one reduces the hysteresis properties of butyl rubber to a lower loss level at temperatures such as are induced by the running of a tyre on a fast car, a very marked loss in reinforcement occurs; the same phenomenon can be

observed, although in lesser degree, with natural rubber or SBR.

These observations suggest a good deal of filler-rubber energy has to be dissipated to achieve reinforcement. The work of Mullins and Schallamach points towards stress spreading at the point of mechanical rupture. Hysteresis is important in abrasion and, at very high rates of tear, the strength of a tyre tread compound is about equal to a pure gum stock. The interpretation is that failure proceeds from filler particle to filler particle, the heat generated softening the tear tip and spreading the load, thus giving rise to 'knotty' tear on a microscale, leading to 'knotty' tear on a macroscale, widening of the tear tip and generally spreading the load. When tear proceeds at very high rates the tear tip advances too quickly for the softening process to precede it sufficiently and 'knotty' tear does not result.

This concept of stress spreading finds a corollary on a chemical or physico-chemical basis as shown by Wake. His work suggests that, far from high specific attachments such as true free radical reactions making carbon black outstanding as a reinforcing material, the effect is due to the ability of carbon black to form a large number of relatively weak attachments of a Van der Waals nature having the power of re-adsorption on another portion of the elastomer molecule when torn away from their original sites. This results in the bond being mobile, thus giving way and reorienting in the face of applied forces. The Van der Waals forces associated with ionic crystals and other highly polar systems can be much greater than carbon black offers, as may be demonstrated by heats of wetting experiments, but such attachments are considered to be static and lack the ability to reform readily in other positions along the elastomer molecule once having been desorped.

The foregoing observations do not deny the formation of free radicals during milling, and perhaps curing, which give true chemical bonds between the surface groups on carbon black and the rubber molecule. They suggest that free radical attachments may be associated with stiffness in unvulcanized and vulcanized rubbers and their destruction could cause the stress relaxation phenomenon known as the 'Mullins effect.' The work of Payne in the field of dynamic moduli at very low strains gives promise of additional data on these points.

North Switch to Nylon

In July 1959, James North and Sons Ltd., introduced a new range of chemical resistant clothing in their Northylon material. The range has proved so very successful that the company is to supply all chemical resistant garments in Northylon as from May 15. The material is a low twist high-tenacity, nylon fabric, coated with PVC.

The success of this range of clothing has prompted the company to branch out into a new field—the manufacture of Northylon covers, salvage sheets and tarpaulins.

All technical information, sample cuttings and details are available from James North and Sons Ltd., Home Sales Division, Kirkman House, 54a Tottenham Court Road, London, W.1.

Bigger Range

Further details have been issued of the take-over by Barrow Hepburn and Gale of the US company, Colloids Inc. (*RJIP* March 19, 441). Since 1958 some of Colloids' products have been manufactured by a BHG subsidiary, Richard Hodgson and Sons of Beverley, Yorks.

Now the acquisition will extend the range of products manufactured at Beverley, which at the moment include a range of foam control agents which function both as anti-foam and as defoaming agents.

Mr J. A. Budd has been appointed chairman of Sungei Siput Rubber Plantations and Rini (Malaya) Rubber Estates in place of Mr C. D. Rotch.

Howard W. Franklin

An Appreciation

THE Rubber Industry has lost a well-known figure in the passing in his 81st year of Mr Howard W. Franklin, who took a great interest in all the industry's activities.

H. W. FRANKLIN

'Howard,' as he was affectionately known by his many friends, was an enthusiast in everything he undertook, whether it was a matter of serious business or social or sporting affairs. He had such a natural charm that it was always a delight to be in his company and it is difficult to realize that he is no longer with us.

When the Institution of the Rubber Industry was formed in 1921 he was one of the founder members, devoting much of his time to promoting goodwill in the industry. For nearly twenty years he acted as hon. treasurer then in 1946 he became president. The following year saw him vice-president of the Research Association of British Rubber Manufacturers, and in 1947-1948 he was its president, when he did much good work in the development of the technical side of the industry.

During all this time he was extremely active in the IRI Golfing Society for he was its first captain and its only president since the year of its inception. Furthermore he played an excellent game and had the distinction of winning the coveted Wallwork Cup on two occasions, the first time being on the Hesketh Course in 1922 and again at Gullane fourteen years later.

The family business which, at a later date, became J. G. Franklin and Sons Ltd., was founded by his father in 1864, and on his father's death in 1896, Howard succeeded him, becoming chairman and managing director in 1900 when he came of age. During the following sixty years of activity in the rubber industry and in other directions, it is only natural that he became so well known and admired by a great number of people, not only in Britain but in many other countries of the world.

It too rarely happens that a man whose business interests occupy such a large part of his everyday life, can at the same time devote so much of his energies to looking after the well-being of others. Such men help greatly to bring happiness to the community and without their untiring efforts the world in general would be so much the poorer. Such a man was Howard Franklin that he did a great deal to lighten the burden of others, all done in a quiet unassuming and consequently far more effective way. He never looked for any reward except for the pleasure he derived.

To meet him in business or socially was really something very pleasant at all times. He was a loyal and trusted friend: a man with a great heart, courageous with great ability, full of sympathy and helpful in the extreme.

The loss to his four sons and their families is great and his memory will always be cherished by many.

Rubber Statistics

WORLD POSITION AT THE END OF JANUARY

PRELIMINARY information on the world rubber position published under this heading on April 16 can now be amplified. The following table (in 1,000 long tons), shows the natural rubber production position during January and compares it with that of a year previously:

NATURAL PRODUCTION

	Jan. 1960		Jan. 1959	
Malaya:				
Estates	37¾		37½	
Smallholders ..	27½		27¼	
	—	65¼	—	64¾
Indonesia:				
Estates	18		20¼	
Smallholders ..	27½		22¼	
	—	45½	—	42½
Ceylon		10¾		9
Sarawak		3¾		2½
Other British Borneo		1¾		2
Liberia		3¾		4½
India		2½		2¼
Vietnam		8		7¾
Cambodia		3¼		3¼
Others		25¼		36½
		170		175

The only clear trend so far this year is that shown by the continuing fall in Indonesian estate production, which is more than offset, however, by the rise in output on smallholdings. The figures for Thailand were not available when this table was compiled; there, too, last year's increased output will probably have been maintained in the early part of this year.

The following table shows the natural rubber consumption position during January:

NATURAL CONSUMPTION

	Jan. 1960	Jan. 1959
UK	14¾	15¼
USA	46½	50
France	11½	11¾
Western Germany ..	11¾	12½
Remainder of Europe ..	44	45
Others	54	55½
	182½	190

Here there has been a slight, but nonetheless perceptible, falling away in demand in each territory; this contrasts sharply with the steady increase everywhere as revealed by the next table for synthetic rubber consumption:

SYNTHETIC CONSUMPTION

	Jan. 1960	Jan. 1959
UK	8¼	5¾
USA	95	89½
France	6½	5
Western Germany ..	7½	5
Remainder of Europe ..	7½	5
Others	15½	12½
	140	122½

Total new rubber consumption in January, at 322,500 tons, represented an increase of 10,000 tons compared with the total amount consumed during January of last year.

Sole Crepe

The Secretariat of the International Rubber Study Group has now released details of the exports of sole crepe which took place during February last. In the case of Malaya, these amounted to 848 tons, a reduction of some 40 tons compared with exports during January, while Ceylon's exports were halved at 55 tons. Ceylon has now been overtaken by Vietnam as the second largest producer of sole crepe, 103 tons having been exported from that country in February, but no sole crepe was exported from the neighbouring territory of Cambodia during either January or February.

Malaya's main customer for her sole crepe was as usual the UK, which took 440 tons followed in order of importance by Spain, taking 173 tons. Among other countries, France took 58 tons and Japan 41 tons.

PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Polyisoprene

No. 826,918. The Firestone Tire and Rubber Co. Application and Filed, August 29 1956. Application in USA, September 1, 1955. Published, January 27 1960.

Isoprene is polymerized in the presence of lithium metal and a saturated hydrocarbon solvent which is liquid under the reaction conditions. Polymerization is effected in the absence of oxygen or oxygen-containing substances and the preferred solvent is petroleum ether. The polymers consist essentially of *cis*-1,4-polyisoprene and polymers with average molecular weights approximating that of natural rubber have been produced by the process.

Polyisoprene made according to the process of the invention was compared with Hevea rubber in pure gum and carbon black stocks, the properties of the vulcanizates of the two rubbers being closely similar. Tyres with treads of the polyisoprene and Hevea rubber respectively were compared on a test fleet car run at high speeds. After 12,000 miles, the polyisoprene tread had a wear rating of 92 compared with 100 for the Hevea rubber tread. The Hevea rubber tread was badly cracked whereas the polyisoprene tread exhibited only slight tread cracking.

Flame-Sprayed Metal Moulds

No. 827,266. United States Rubber Co. Application and Filed, January 30 1958. Application in USA, March 18 1957. Published, February 3 1960.

A metal coating is made by flame-spraying a number of metals simultaneously on to a surface and then sintering the deposited metals at certain temperatures. The melting points of the metals differ by at least 150°F., the metal of lowest melting point being a self-fluxing brazing alloy, while the sintering temperature is the same as, or greater than, the melting point of the brazing alloy but lower than the lowest melting point of the other metals. The process may be used for producing moulds which will withstand the pressures used in compression moulding of rubber and plastics. A plaster model is coated with sodium silicate, a base layer of a hard metal such as a chrome nickel alloy is sprayed on to the sodium silicate and a backing layer of a combination of metals is then sprayed on to the base layer by the process of the invention. The production of a golf ball mould is described as an example.

Shorter Abstracts

Polythene-Butyl Rubber Composition. 825,884. Phillips Petroleum Co. Filed, January 31 1957.—The resistance to sag and cold flow of unvulcanized butyl rubber is improved by incorporating 1 to 20 parts of highly crystalline polythene in 100 parts of the butyl rubber.

Cellular Rubber. 826,161. Zellstoff-fabrik Waldorf. Filed, September 19 1956.—Lignin is used as a filler for cellular natural and synthetic rubber, the proportion of lignin being 50 to 150% by weight with respect to the rubber and the composition containing not more than 20% of inorganic filler by weight on the rubber.

Snow Plough. 826,662-3. G. Brock. Filed, February 27 1957.—A mould board for a snow plough is made of rubber. No. 826,662 relates to the construction of the board and No. 826,663 to a structure for fixing the board to a motor-driven vehicle.

Polymerization of Ethylene. 826,787. Imperial Chemical Industries Ltd. Filed, March 24 1958.—Mixed anhydrides of hyponitrous acid and at least one organic monoester of carbonic acid are used as catalysts for the polymerization of ethylene and other ethylenically unsaturated compounds.

Synthetic Rubber Prices

Prices of synthetic rubbers appear regularly in RUBBER JOURNAL AND INTERNATIONAL PLASTICS *in the first week of each month. It will be appreciated if suppliers will give notification of any price changes or additions to their range. C/f duty paid quotations are subject to slight variation due to exchange, ocean freight and insurance fluctuations. Prices are in pence per lb., except where otherwise stated.*

(e-qdp)—Ex-quay duty paid (cif UKdp)—cif UK duty paid (e-i)—Ex-installation (ddp)—Delivered duty paid (e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered BM—black masterbatch CBM—cold, black masterbatch CNP—cold, non-pigmented CNS—cold, non-staining COE—cold, oil extended COELC—cold, oil extended, light coloured CO/BM—cold, oil/black masterbatch CPOE—cold, pigmented, oil extended CRE—cold, rosin extended dw—Dry weight HN—high nitrile HNP—high nitrile, powder HP—hot, pigmented HS—high styrene HMW—high mol. wt. LMW—low mol. wt. MHN—medium high nitrile MLN—medium low nitrile MMW—medium molecular weight MN—medium nitrile NS—non-staining TS—total solids

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (e-qdp)
(min., 70,000-lb. lots)

1000 Hot, Non-Oil	23.10
1001 ,, ,,	23.10
1002 ,, ,,	23.34
1006 ,, ,,	23.34
1007 ,, ,,	23.34
1009 ,, ,,	23.71
1011 ,, ,,	23.71
1012 ,, ,,	23.24
1013 ,, ,,	23.94
1500 Cold, Non-Oil	23.10
1501 ,, ,,	23.10
1502 ,, ,,	23.10
1703 COE, 25% oil	*20.31
1705 ,, ,, ,,	*20.07
1707 ,, 37.5% ,,	*18.89
1708 ,, ,, ,,	*18.89
1710 ,, ,, ,,	*18.66
1712 ,, ,, ,,	*18.66

*Under 70,000 lb., min. 600 lb.

ASRC (American Synthetic Rubber Corpn.) (cif UKdp*)
(carloads lots of 30,000 lb.)

1000 Hot, Non-Oil	23.99
1001 ,, ,,	23.99
1004 ,, ,,	23.99
1006 ,, ,,	23.99
1009 ,, ,,	24.61
1018 ,, ,,	26.74
1019 ,, ,,	26.26
1500 Cold, Non-Oil	23.99
1502 ,, ,,	23.99
1503 ,, ,,	26.02
3110 ,, ,,	25.78
1703 COE	20.69
1708 ,,	19.27

*US $ conversion rate $2.80

Cariflex (Shell Chemical)

	(e-sUK)
S-1000 Hot	22.25
S-1002 ,,	23.375
S-1006 ,,	22.25
S-1009 ,,	24.0
S-1011 ,,	24.0
S-1013 ,,	24.0
S-1100 Hot black	19.75
S-1500 Cold	22.25
S-1502 ,,	22.25
S-1509 ,,	22.25
S-1600 Cold black	19.625
S-1602 ,, ,,	19.625
S-1605 ,, ,,	19.375
S-1703 COE	20.25
S-1707 ,,	18.0
S-1709 ,,	17.75
S-1712 ,,	17.75
S-1803 COBM	17.875

FR-S (Firestone) (cif UKdp*)

1000 Hot	24.10
1001 ,,	24.10
1004 ,,	24.10
1006 ,,	24.10
1007 ,,	24.10
1500 Cold	24.10
1502 ,,	24.10
146 ,,	24.10
1703 Oil-Extended	20.00
1710 ,,	18.85
1712 ,,	18.85
123 ,,	19.187
155 ,,	18.5
173 ,,	20.00
178 ,,	19.10
184 ,,	18.85
1009 Specialty	24.75
1010 ,,	26.00
1012 ,,	24.25
1013 ,,	25.00
1014 ,,	28.10
1015 ,,	28.75
141 ,,	28.625
181 Specialty	24.10
182 ,,	25.00
158 ,,	29.5

*US $ conversion rate $2.80

Int. Synthetic Rubber (d)

Intol 1500	22.5
Intol 1502	22.5
Intol 1006	22.5
Intol 1710	18.0
Intol 1712	18.0
Intol 1778	18.25
	(ex-wks TS)
Intol Latices R23 M23	22.25

Naugapol (Naugatuck Chemical)

	(e-sUK)
1016	28.0
1018	28.5
1019	28.0
1022	30.75
1023	32.75
1503	27.75
1504	34.0
6101	26.25
6102	27.75
K-45	30.5
K-50	31.25
KO-50	29.0

Philprene (Phillips) (e-qdp*)

1000 Hot, Non-Pig	23.28
1001 ,, ,,	23.28
1006 ,, ,,	23.28
1009 ,, ,,	24.69
1010 ,, ,,	25.86
1018 ,, ,,	26.80
1019 ,, ,,	26.33
1100 HP	19.65
1104 ,,	19.28
1500 CNP	23.28
1502 ,,	23.28
1503 ,,	26.10
1601 CP	19.56
1605 ,,	19.28
1703 COE	20.23
1706 ,,	19.94
1708 ,,	18.82
1712 ,,	18.58
1803 CPOE	17.78
1805 ,,	15.99

*US $ conversion rate $2.81½

Plioflex (Goodyear) (ex-wUK)

1006 HNP	22.25
1500 CNP	22.25
1502 ,,	22.25
1507 ,,	22.25
1508 ,,	22.25
1006 S	22.75
1703 COE	19.25
1710 ,,	17.75
1712 ,,	17.75
1773 COELC	19.25
1778 ,,	18.0
B—6	27.5
B—5	28.0

Polysar (Polymer UK) (e-sUK)

S Hot	22.25
S-630 Hot	22.25
Kryflex 200 Cold	23.5
Krylene	22.25
Krylene NS	22.25
Krylene 602 Cold	22.25
Krynol 651 COE	17.75
Krynol 652 ,,	18.0
S-X 371 Process Aid	24.0

SBR LATICES

Copo (Copolymer) (cif UKdp)
(10-ton lots)

2101 (dw)	46.30
X-765 ,,	40.80
X-800 ,,	37.20
2102 ,,	38.00
2105 ,,	38.00

Naugatex (Naugatuck Chemical)

	(ex-wUK)
J8174	39.5
2000	40.0
2001	40.0
2002	40.0
2006	48.5
2105	40.0
2107	40.0
2108	42.25
2711	39.75
2714	39.75
2733	40.25
2734	40.25
2740	45.25
J8535	38.75
2113	39.25

Pliolite Rubber (Goodyear) (d)

2000	40

Latex

2001 (dw)	40
2104 ,,	40
2105 ,,	40
2108 ,,	40
5350 ,,	40

Pliolite Resin (Goodyear) (d)

101A (dw)	44
150 ,,	50
151 ,,	35
160 ,,	50
170 ,,	50

Hycar (B. F. Goodrich) (ddp)

2507 (HS) dw	48

Polysar (Polymer UK) (e-sUK)

Latex, type IV	32.5 TS
Latex, type 722	31.75 TS
(Non-returnable 45-gallon drums)	
	(e-i)
Latex, type 722 (bulk quantities)	28.75 TS

Int. Synthetic Rubber (ex-wks)

Intol Latex R23	22
Intol Latex M23	22

Dylex (Koppers Int. CA) (fas)

K-42A	31.6
K-52	31.6
K-31	31.6
K-900	31.6

ACRYLONITRILE TYPES

Butaprene N (Firestone) (cif UKdp)

NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum (e-s)

N—1	75
N—3A	52
N—5	52
N—6G	45
N—7	45
N—8	45
N600X	45

Hycar (British Geon) (UKd)
(500-lb. lots and over)

1001 High Nitrile Hot	52
1041 ,, ,, Cold	52
1002 MHN Hot	45
1042 ,, Cold	45

Hycar (B. F. Goodrich) (ddp)
(500-lb. lots and over)

1411 HNP	66
1432 MHN (crumb)	64
1072 ,, (carboxyl)	66
1312 ,, (liquid)	55
1043 MLN	51
1014 Low Nitrile	61

I.C.I. (min., 5-cwt. lots) (UKd)

Butakon A-4051 HN Cold	52
Butakon A-3051 MN Cold	45
Butakon A-3002 ,, ,,	45

Paracril (US Rubber) (e-sUK)

18-80 Low Nitrile	61
AJ ,, ,,	50
B MLN	51
BJ ,,	51
BLT ,, Cold	51
BJLT ,, ,,	51
C MHN	59
CLT ,, Cold	59
CV ,, (crumb)	60
D High Nitrile	67
ALT	51
OZO	47

Polysar (Polymer UK) (d)

Krynac 800 MN	45
Krynac 802 LN	45
Krynac 803 MN (low Mooney)	45
Krynac 801 HN	52
Krynac 804 (MN-cross linked)	45

ACRYLONITRILE LATICES

Butaprene N (Firestone) (cif UKdp)

N-300 (dw)	53
N-400 ,,	60.5

Chemigum Latex (Goodyear) (d)

200 (dw)	65
235 CHS ,,	60
236 ,,	60
245 B ,,	52
245 CHS ,,	52
246 ,,	52
247 ,,	52
248 ,,	52

Hycar (B. F. Goodrich) (ddp)
(dry weight, drum lots)

1551 High Nitrile	66
1552 MHN	57

Hycar (British Geon) (UKd)
(dry weight, 3 drums and over)

1561 High Nitrile	60
1571 ,, ,, (carboxyl)	60
1562 MHN	52
1577 ,, (modified)	52

Nitrex (Naugatuck Chemical)

	(e-sUK)
J6849	56.75
2612	53.75
2616	63.0
2619	62.75
2620	55.5
2625	54.5
2625-A	54.5

ACRYLIC TYPES

Hycar (B. F. Goodrich) (ddp)

4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso

	(e-sUK)
Regular 035	21.75
Regular 150	21.75
Regular 215	21.75
Regular 217	21.75
Regular 218	21.75
Regular 325	21.75
Non-staining 065	22.75
Non-staining 165	22.75
Non-staining 265	22.75
Non-staining 267	22.75
Non-staining 268	22.75
Non-staining 365	22.75

Vistanex (Polyisobutylene) (e-qdp)

MS LMW	54
MH ,,	54
L-80 MMW	54
L-100 ,,	54
L-120 ,,	54
L-140 ,,	54

Polysar (Polymer UK) (e-sUK)

Butyl 100	21.75
Butyl 200	21.75
Butyl 300	21.75
Butyl 301 NS	21.75
Butyl 400	21.75
Butyl 101 NS	26.25
Butyl 402 NS	22.5

Hycar (B. F. Goodrich) (ddp)
(500 lb. and over)

2202 Brominated	68

NEOPRENES

	(ddp)
W and WHV (dwdel)	42.62
WRT ,,	48.37
WX ,,	44.62
GN ,,	44.62
GNA ,,	44.62
GRT and S ,,	45.62
AC ,,	57.125
KNR ,,	75.62
AC 'M' and 'S' ,,	57.125
CG ,,	57.125
AD ,,	57.125

Latices—Dry
(per lb. del, min., 50 lb.)

571	49.75
842A	49.75
572	51.25
601A	51.87
650	54.125
735	51.25
736	51.25
950	58.25
60	51.87
750	51.25
635	53.62

SILICONE RUBBERS

Midland Silicones
(500-lb. lots del)

Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23s. 6d.

I.C.I. Silicones

Gums (40-lb. lots del)	39s. 6d.-47s.
Stocks (250 lb. lots del)	22s.-35s.
Pastes (1000 lb. lots del)	27s. 6d.-35s. 9d.

REINFORCING RESINS AND RUBBERS

I.C.I. (min., 2-ton lots) (UKd)

Butakon S-8551	36.5
Butakon S-7001	33.5

Hycar (B. F. Goodrich) (ddp)

2007 (powder)	42.5

Pliolite (Goodyear) (d)

S—6B	36.5

Polysar (Polymer UK) (e-sUK)

SS-250 HS (bale)	27.25
SS-250 ,, (flake)	27.5
Kryflex 252 HS	25.5
Kryflex 202 (HMW Cold polymerized)	25.75

Cariflex (Shell) (e-sUK)

SP-103	28.0

Cyclite (Durham Raw Materials) 4/42

HYPALON

	(ddp)
20	48
30	60.25
40	50.75

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THE spark has been missing in the stock market over the past few weeks. Trading has been extremely quiet and share prices left to find their own levels. As a result on Thursday of last week the industrial equity share index plumbed a new 'low' for the year. Main reason why buyers kept away was the threat of a new credit squeeze. Everyone was waiting for some kind of guide from Chancellor Amory whose sly winking and nodding had put investors in a fine dither.

Well, as is well known now, he decided to publicly disclose his plans during Question Time in the House of Commons on the same day as above, and, as anticipated, he introduced his special deposits weapon and curbs on hire purchase business. But both were milder than at one time seemed likely. This spread a little momentary cheer and the following day there was a return to the up-line throughout most sections.

But the outlook for many people still remains obscured by such influences as Wall Street trends, forecasts of bear markets ahead and the external trade position. The fresh bout of uncertainty that caused a further relapse in prices on Monday therefore suggests that future trends will remain in a highly sensitive state for the time being.

For the moment, at any rate, we still consider that first class shares should be retained. The month of May is a big one for company news. Most of it we forecast will be of record trading and higher dividends.

This should at least give some kind of assistance to sentiment. We feel that it just might turn the scales in favour of a further gentle upswing—nothing of course to compare with what we have experienced over the past 12 months.

Meantime, the flood of reports from company boardrooms continues to arrive almost by the hour. Mr George Beharrell, head of the giant DUNLOP RUBBER group, said at a recent conference that the directors were 'still by no means content' with the return on the capital employed. He would be disappointed 'if we do not show a steadily increasing return in the future.'

In the annual report to shareholders it was disclosed that trading results for the last quarter exceeded expectations, and group profit for this period was 22% higher than in the first half. For the full trading period the increase was 16% and the 1959 result constituted a record. Overseas the group did well and total profit from these sources was considerably greater, contributing a higher proportion of profits than in 1958. Year-end commitments totalled £3.9 million. Capacities are being expanded to meet increasing requirements of the motor industry in the United Kingdom. Expansion is also proceed-

Continued on page 709

Share Price Movements

Par Value	Company	1958-59 High	Low	April 23	Latest
£1	A.E. Ind. Ord.	67/6	53/9	51/6	54/9
5/-	Albright & W. Ord. ..	31/-	13/4½	27/6	26/3
£1	„ „ „ 5% Pref.	18/9	15/4½	16/-	16/6
5/-	Anchor Chemical Ord...	27/6	10/3	24/9	16/-xc
5/-	Andersons Rub. Ord. ..	4/6	1/1½	3/1½	3/1½
£1	Angus Geo. Ord. ..	47/3	25/3	47/-	46/-
5/-	Ault & Wiborg Ord. ..	24/-	11/6	23/3	21/9
£1	Avon India Rubber Ord.	47/6	35/6	37/6	36/3
£1	„ „ „ 6% Pref.	18/9	16/6	18/9	18/9
10/-	Bakelite Ord.	47/3	22/-	47/6	47/3
£1	„ 6% Pref. ..	19/6	17/6	18/-	19/-
£1	Baker Perkins Ord. ..	53/9	41/3	51/3	52/6
4/-	Bank Bdg. Rubber Ord.	3/7½	1/6	3/6	3/-
5/-	Boake (A) Roberts Ord.	30/3	12/3	30/3	30/3
£1	„ „ „ 5% Pref.	16/9	13/9	16/3	16/3
4/-	Brammer H. Ord. ..	18/3	9/6	18/-	17/6
10/-	Bridge, David Ord. ..	58/-	24/3	56/-	56/-
5/-	Bright, John Ord. ..	18/9	9/6	17/3	17/3
2/-	Brit. Ind. Plas. Ord. ..	13/6	6/9	7/1½	7/0
2/-	„ 10% (tax free) Pref.	4/9	3/-	4/6	4/6
£1	British Xylonite Ord. ..	90/6	46/-	90/-	95/-
£1	„ „ 5% Pref.	16/9	15/-	16/9	16/9
£1	BICC Ord.	61/-	44/6	56/3	55/-
5/-	BTR Ind. Ord.	13/3	8/1	12/3	12/-
£1	„ „ 7½% Pref. ..	24/3	20/9	23/9	23/9
£1	Courtaulds Ord. ..	67/9	20/-	61/9	61/6
£1	„ 5% 1st Pref.	18/9	15/7	17/3	16/6
£1	„ 6% 2nd Pref.	22/6	19/-	20/6	19/6
4/-	Cow, P. B. Ord. ..	8/3	6/6	8/6	8/6
£1	„ „ 5% Pref. ..	15/5	12/6	15/-	15/-
1/-	Dannimac Mfg. Ord. ..	11/6	5/2	11/3	10/6
10/-	De La Rue Ord. ..	73/9	42/9	65/-	62/-
£1	„ „ „ 3½% Pref. ..	12/9	10/6	11/6	11/6
10/-	Distillers Co. Ord. ..	39/6	23/6	36/3	36/6
£1	„ „ 6% Pref...	23/-	19/6	21/-	20/6
£100	„ 5% Conv. Loan	£97	£92	£97	£96
£100	„ 5½% Unsec. Loan	£98½	£90	£92½	£90
10/-	Dunlop Rubber Ord. ..	29/9	17/-	25/10½	26/9
£1	„ „ 5½% Pref.	20/3	16/3	18/-	18/-
£100	„ 3½% 1st Debs.	£78	£71½	£76½	£76
£100	„ 4½% 2nd Debs.	£88	£80½	£86	£86
£1	Eng. Elect. Ord. ..	61/-	37/9	40/6	40/3
4/-	Ebonite Cont. Ord. ..	15/3	11/-	14/3	12/6
£1	English China Clays Ord.	94/3	47/-	76/9	76/3
£1	Goodyear Tyre 4% Pref.	13/-	11/9	12/-	11/9
5/-	Greeff Chem. Ord. ..	33/3	15/-	31/9	34/3
10/-	Greeff Chem. 5½% Pref.	8/9	7/6	8/9	8/9

Par Value	Company	1958-59 High	Low	April 23	Latest
5/-	Hackbridge Hldg. ..	19/9	14/-	15/7½	15/7½
4/-	Greengate & Irwell Ord.	7/-	4/-	5/9	5/3
£1	Harrisons & Crosfield Dd.	64/-	30/9	53/9	53/9
1/-	Hunt & Moscrop Ord...	2/6	1/1½	2/3	2/-
£1	Imp. Chem. Ord. ..	63/1½	32/9	58/-	56/-
£1	„ „ 5% Pref. ..	19/-	15/6	16/9	16/9
£100	„ 4½% Unsec. Loan	£90½	£84	£87	£87
£100	„ 5½% Conv. Loan	£196½	£178	£186	£182
1/-	Kleemann (O. & M.) Ord.	10/3	4/3	9/9	9/6
£1	„ „ 6½% Pref.	19/-	14/-	18/9	18/9
2/-	Lacrinoid Prod. Ord. ..	4/3	1/5½	4/-	3/6
5/-	Laporte Ind. Ord. ..	34/9	19/3	33/3	27/6xc
£1	„ „ 7½% Pref.	24/3	21/10½	23/9	23/9
£1	Leyland & Birm. Rubber Ord.	59/-	39/9	49/-	51/3
£1	„ „ „ 6% Pref.	19/-	17/-	18/9	18/9
2/-	London Rubber.. ..	14/9	6/3	13/-	12/6
£1	„ 6% Red. Cum. Pref.	20/-	16/3	18/9	18/9
£1	McKechnie Bros. Ord...	71/3	39/3	67/-	64/-
£1	„ „ 'A' Ord.	67/6	38/9	65/-	62/-
£1	„ „ 6% Cum. Pref.	17/-	16/-	17/-	17/-
5/-	Monsanto Chem. Ord. ..	27/9	14/9	25/9	24/3
£1	„ „ 3¾% Pref.	13/6	12/-	13/3	13/-
£100	„ „ 6% Debs.	£104½	£101	£104	£102
5/-	Miles (H.G.) Holdgs. Ord.	11/3	5/-	11/3	11/-
£1	North British Rubber ..	21/3	15/7½	20/6	19/-
5/-	Plastic Enginrs. Ord. ..	28/-	10/3	23/-	22/9
5/-	Redfern Holdings Ord...	7/-	2/6	5/3	5/9
2/-	RFD Ltd. Ord.	6/9	4/-	5/6	5/6
£1	„ „ 5½% Pref. ..	16/6	12/-	13/9	13/9
2/-	Rubber Imp. Ord. ..	10/9	4/-	5/-	5/-
2/-	„ „ 'A' Ord. ..	10/3	3/6	4/6	5/-
£1	„ „ 5% 1st Pref.	13/3	10/-	12/-	12/3
5/-	Rubber Reg. Ord. ..	19/-	10/-	18/-	17/-
4/-	Shaw Francis Ord. ..	26/3	13/6	26/3	23/9xc
2/-	Silentbloc Ord.	13/-	7/6	12/6	11/-
5/-	Storey Bros.	36/-	13/1	35/-	34/6
2/-	Sussex Rubber Ord. ..	2/1	1/3	1/9	2/3
5/-	Sutcliffe Speak Ord. ..	15/6	6/3	16/-	13/9
£1	Turner & Newall Ord. ..	113/9	68/6	105/7½	105/-
£1	„ „ „ 7% Pref.	25/6	22/6	23/3	23/3
5/-	Universal Asbestos Ord.	43/-	14/3	39/6	39/9
5/-	Viscose Dev. Ord. ..	15/-	9/-	15/-	15/-
5/-	Warne William (Holdgs.) Ord.	19/3	10/9	18/3	17/-

Rubber Markets

LONDON

During the past week the market has followed an advancing trend at Singapore, although rather reluctantly, but the higher prices were not accompanied by any large weight of new business. Near positions received some interest on covering account and gained 1d. per lb., while distant positions, which were relatively neglected, advanced by three-eighths of a penny.

Latest prices are as follows:

No. 1 RSS Spot: 36½d. buyer, 36¾d. nominal seller.

Settlement House:

June 36d.-36¼d.

July/September 34⅝d.-34⅞d.

October/December 33½d.-33¾d.

January/March 32⅝d.-32⅞d.

April/June 32⅛d.-32⅜d.

No. 1 RSS cif basis ports:

May 35⅞d.-36⅛d.

June 35⅛d.-35⅜d.

Godown:

May 123¼ cents nominal.

LATEX

Centrifuged latex per gallon in drums, seller, June 20s. 5d., cif European ports, Spot, seller, 20s. 11d. Bulk, d.w. 20s. 2d. Creamed, seller, June 20s. Normal, seller, June 16s.

DJAKARTA

Transactions on May 2 included 30 tons of sheet No. 1 at 47.65 rupiahs per kilo. There was strong demand for Brown No. 3. The market closed very steady.

	Rupiahs per kilo	
	May 2	Prev.
Spot No. 1 Priok ..	47.00b	46.00
Spot No. 2 Priok ..	46.00b	45.00
Spot No. 3 Priok ..	45.00n	44.00
No. 1 fine pale crepe, spot	41.00b	40.50

Tone: Very steady.

AMSTERDAM

The Amsterdam rubber market ruled as under on May 2:

	Guilders per kilo	
No. 1 RMA	May 2	Previous
May	3.46	3.46
June	3.45	3.46
July	3.38½	3.37½
August	3.38½	3.37½
September ..	3.37½	3.37½
July/Sept... ..	3.38½	3.37½

Sales: 15. Tendency: Steady.

SINGAPORE

The market on May 3 was steady during early trading on some interest in May No. 1 RSS and prices advanced to 123½ Malayan cents. Upcountry godown liquidation and absence of interest in lower sheet caused prices to decline by 1 cent. Factories were quiet. The May delivery No. 1 RSS premium moved to 2¼ cents over June. The afternoon market was quiet and prices tended to ease slightly. The May premium over June widened to 2½ cents. Factories were in the market for small quantities. After hours, the market was quiet. No. 1 for May delivery buyers was ¼ cent below the previous final level at 123¼ Malayan cents per lb.

	Malayan cents per lb., fob Malayan ports to open ports	
	May 3	Prev. Close
No. 1 RSS, May	123¼–123¾	123¼–123¾
June	120⅝–120⅞	121¼–121½
No. 2 RSS, May	118⅞–119⅛	119¼–119⅝
No. 3 RSS, May	115⅞–116⅛	116 –116¼
No. 4 RSS, May	113 –114	114 –115
No. 5 RSS, May	110¼–111	111 –112
No. 1 Spot ..	122⅞–123¼	123⅛–123½
No. 3 blanket thick remilled crepe, May ..	112 –114	112½–114½
No. 1 fine pale crepe, May ..	129 –131	130½–132½
2x thin brown crepe, May ..	111¾–112¾	112 –113

Tone: Quiet

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums fob at 232.40d. per gallon.

BANGKOK

No. 1 RSS

The price of No. 1 RSS at Bangkok on May 3 was 37.75 (38.00) US cents per lb.

NEW YORK

The New York rubber market ruled as under on May 2:

DEALERS' PRICES

	US cents per lb.	
	May 2	Previous
No. 1 RSS, May ..	40⅜n	40½n
June ..	40¼n	40¼a
No. 2 RSS, May ..	40¼n	40⅜n
June ..	40n	40¼a
No. 3 RSS, May ..	40¼n	40¼n
June ..	39¾n	40a
No. 1 RSS, Spot ..	40⅜n	40½n
No. 3 amber blanket crepe, July	38⅜n	38⅜b–39a
No. 1 latex thin crepe, May	44⅜n	44⅜n
No. 1 latex thick crepe, May	44¼n	44⅜n

FUTURES—REX CONTRACT

	May 2	Previous Close
May ..	40.50t	40.55b–40.65a
July ..	39.55b–39.65a	39.72t
Sept. ..	39.00t	39.31t
Nov. ..	38.40b–38.50a	38.65b–38.80a
Jan. ..	37.80b–38.10a	38.05b–38.30a
March ..	37.40b–37.70a	37.45b–37.70a
May ..	37.00b–37.30a	37.00b–37.30a

Sales: 47. Tone: Steady.

Rubber futures were softer on May 2 on scattered selling, partly induced by the GSA announcement that it was offering rubber from the stockpile 'as is' on a discount basis of ¼ cent per lb. under the market price. Trading was moderate. Physical rubber was quiet.

CEYLON

No. 1 RSS

The price of No. 1 RSS at Colombo on May 3 was 144½ (144½) Ceylon cents per lb.

STOCK MARKET

Continued from page 708

ing in several overseas factories in countries where demand for tyres is increasing rapidly.

There was good news from the ASSOCIATED ELECTRICAL INDUSTRIES combine too. 'The demand for all our products has shown a notable increase and we are budgeting for increased profits on our ordinary trading accounts,' said Lord Chandos, the chairman, recently. He added the warning, however, that this prospect should be received with reserve—the future was never certain. His speech to shareholders was optimistic and applied particularly to his review of conditions in parts of the business that had been 'giving trouble.' On the cable side where the turn-round from profits to losses had made an adverse difference of £1,400,000 to trading results, marginal profits were expected in 1960. After the expected completion of rationalization before the beginning of 1961 'our strong position,' said Lord Chandos, 'should give us adequate profits on the capital invested.'

At the annual meeting of O. AND M. KLEEMANN, the chairman said that with four months' trading nearly completed, turnover and profits continued to increase in a most satisfactory manner.

ROBERT PICKLES have increased their dividend by 5% to 30%. Net profit works out at £20,000 against a previous £20,700. This is after meeting a tax bill of £20,800 as compared with only £7,400 and depreciation of £12,900 (£11,000). The 1959-60 figures cover the company and its former subsidiary BIILLINGTON AND BRIDGE. Assets of the latter were acquired by the company in April 1959.

The directors of HICKSON AND WELCH (HOLDINGS) delighted dealers with their news that the half-time payment was to be doubled to 8%. The rise reflects both increased trading during the first half of the year ending September 30 next, and the board's decision to reduce the disparity between the interim and final which last time was 12%.

Resin-Removing Cream

Synthetic resins and glues are being used increasingly in many branches of industry which are difficult to remove from the hands after work. To overcome this problem Rozalex Ltd. have introduced a Resin-Removing Cream.

This is claimed to remove epoxide, urea-formaldehyde, polyester, polyamide, phenol-formaldehyde, polysulphide, silicone and other synthetic resins from the skin, one application normally being sufficient unless there is gross contamination when a further application may be necessary. The cream is non-abrasive and harmless to the skin.

Industry INTELLIGENCE

Technical Data

Beetle Urea/Epoxy and Alkyd Resins

Beetle Urea/Epoxy Resin L.1853 is a copolymer of a urea resin and an epoxy resin while Beetle Alkyd Resin L.1858 is a soya type oil modified trimethylol propane/phthalic alkyd. Particulars of the properties, solvent tolerances, compatibility with other resins and application in stoving enamels are given in two provisional information sheets issued by B.I.P. Chemicals Ltd., Oldbury, Birmingham.

Resin L.1853. This is a medium-high viscosity resin which produces high gloss films having excellent initial colour and colour retention. The films are resistant to water, dilute acid, alkali and detergent solutions at elevated temperatures. L.1853 is particularly recommended for use in finishes for domestic equipment as well as in finishes required to have resistance to loss of gloss and discolouration when exposed to temperatures up to 150°C. for prolonged periods. Two formulations are given for glossy white stoving enamels containing Resin L.1853.

Resin L.1858. This is a short-medium semi-drying oil modified alkyd resin which has good compatibility with etherified urea and melamine resins. L.1858 is a similar resin to Beetle Alkyd Resin BA.506 but it has a lower viscosity and produces films having superior colour retention and resistance to water and dilute chemicals. L.1858 is recommended for use with etherified urea and melamine resins in the formulation of fast-curing, high-build, durable stoving enamels. In combination with Beetle Urea/Epoxy Resin L.1853, it is recommended for use on domestic equipment. Finishes based on L.1858 are suitable for application by dipping, roller coating or spraying. Formulations are given for (a) a glossy white stoving enamel and (b) a glossy red stoving enamel, both containing Resin L.1858.

Bakelite Resin DSR.19142

Bakelite Resin DSR.19142 is a pre-mixed gel coat system based on high quality general purpose polyester resins. Information on the properties and use of this new resin is given in Advance Information Sheet P.13, issued by Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1.

DSR.19142 has been developed to avoid the necessity for dilution of thixotropic concentrates and the small-scale preparation of gel coat mixes, which is costly. It possesses a degree of thixotropy which ensures that when it is applied in a suitable thickness, the gel coat will not drain from vertical surfaces. DSR.19142 has been specially designed to combine maximum ease of application with minimum risk of air-bubble trapping and subsequent pin-holing. The Information Sheet includes a typical formulation, instructions for handling the mixture and recommendations for its storage.

Esso Butyl Rubber

The Esso Petroleum Company, Chemicals Department, 50 Stratton Street, London, W.1, have recently issued several new Technical Information Sheets Nos. 21-25 inclusive and No. 28, which discuss various aspects of butyl rubber technology. TIS 21 deals with the comparison of butyl and Nitrile rubbers for light coloured appliance parts, with regard to ozone resistance and immersion tests in detergents and bleaches. TIS 24 defines the various terms used in compression testing, and gives stress/compression strain curves for butyl stocks of varying hardness. TIS 22 gives a formulation for mastic application of vinyl-backed pressure sensitive tape. TIS 23 details the desirable qualities and properties of a resin cured butyl using SP-1055, brominated resin. TIS 25 and 28 deal respectively with the uses of butyl rubbers for automotive dynamic applications and as low cost extrusion compounds.

Machines, Materials and Equipment

Stop Valves for Cold Fluids

Hunt and Mitton Ltd. have adapted a standard valve to give a tight shut-off and to isolate the packing from the proximity of very cold fluids.

Called the 'F' type bronze globe pattern hand-wheel operated stop valve, it has a special heat transfer gland. It was adapted for use in the manufacture of ethylene gas, and it is said to overcome snags which arise in the gland when in contact with cold fluids. The special gland fitted to the valve enables it to obtain heat from the atmosphere, which maintains the gland at a normal temperature. It also gives a very tight shut-off.

The valve can be supplied in sizes ¼in. up to 3in.

Bench Press

The J.M.500 bench press is a new machine intended for producing washers and other shaped blanks from a variety of soft to medium materials, including rubber and plastics. The tool unit, which houses the combination tools, pierces the centre and ejects it through the base of the machine; the washer is then ejected by a finger from the scrap strip. Pre-determined counters and material control micro switches are extras to the machine, which can be hand or power operated. The size of the press is 14in. x 15in. x 18in. high (excluding feed trays). Speed is approximately 120 strokes per minute, according to type of material and thickness; capacity is 2¼in. o.d. approximately, or equivalent rectangle. 5in. wide material, ¼in. thick can be accommodated. The drive is by twin V belts (on motorized model) to 12in. cast-iron flywheel. A bottom feed roll is operated by a roller clutch, and a take off unit can be supplied if required.

Makers are John Marshall Ltd., 223 High Street, Henley-in-Arden, Solihull, Warwicks.

New Publications

Flexible Oil Spillage Boom

A booklet issued by William Warne and Co. Ltd., Barking, Essex, describes two types of inflatable rubber boom produced by the company. These are said to be of great value in limiting pollution damage and accidental spillage losses when petroleum and other non-miscible liquids are transferred from ship to ship or ship to shore bases. Advantages claimed for these booms are as follows.

Their flexibility means they yield to waves, thus reducing the necessity for a heavy boom, follow the contours of the waves so do not need to be very large to be effective, can readily be sunk and refloated to allow vessels to pass, are light and collapsible and can therefore be easily transported, are strong and unaffected by oils and sea water.

The booms consist of tubes 8-16in. in diameter, made of fabric reinforced synthetic rubber which does not support combustion and has good abrasion resistance and weatherability. A skirt suitably weighted and strengthened by a chain is suspended from the tube. The booms are made in 50ft. lengths, or less, which can readily be joined together to achieve the required overall length.

Sondes Place Research Institute

The Sondes Place Research Institute, Dorking, Surrey, has evolved from a consulting chemical and chemical engineering practice founded in 1936. Large premises with considerable experimental and workshop facilities were acquired at Dorking in 1947. The organization carries out sponsored research and development in chemistry, chemical engineering, mechanical engineering and related subjects, and does not normally accept work which is outside the knowledge and experience of its staff, although in certain circumstances it will provide research services in collaboration with an outside consultant. A brochure is available from the Institute giving an up-to-date description of the services offered.

SPACE PROTECTION

Wide usage in nuclear installations of all types—and later, even in space applications—is forecast for B. F. Goodrich's Estane (5740x1), which is claimed to withstand damaging effects of gamma radiation better than any other known conventional rubber.

A report on continuing studies of this polyurethane material was given recently in a paper presented to the American Chemical Society by Dr Charles S. Schollenberger. The material's superior radiation resistance could be used to advantage in the manufacture of shielded suits for spacemen, x-ray technicians and personnel associated with nuclear energy applications, Dr Schollenberger said. Its unusual properties should make it 'outstanding' for use in the manufacture of gaskets, tubing, pads and binders for radiation shields needed in many types of nuclear reactor power plants, propulsion systems and many other nuclear installations, he added.

The material is being produced in experimental quantities and potential major industrial uses could include wire and cable jacketing, coated fabrics for tarpaulins and inflatable products, flexible gas tanks for automobiles, fuel hose, belting and engine mounts.

Asbestos Outlook

A. L. Penhale, president of Asbestos Corp. Ltd., told shareholders at annual meeting there was no improvement in first quarter results as compared with corresponding period of 1959. 'However,' he added, 'prospects for the remainder of the year seem somewhat brighter than at this time last year and it seems reasonable to expect that 1960 should be a little better.

'We do not look for a record year by any means: there will be the problem of over-production in the industry to plague us throughout this year, but the markets of the world will surely absorb a little more asbestos fibre in 1960 than in 1959 and we expect to participate in some of the increase.'

Mr Penhale said dollar barriers continue to be an obstacle to increased sales in some countries. This problem had lessened in certain areas, notably in most European countries, though it continued to be a serious difficulty in South America.

Future Events

PLASTICS INSTITUTE

South Wales and Mon. Section.—Wednesday May 11. Annual general meeting at the Angel Hotel, Cardiff, at 6.30 p.m.

Western Section.—Wednesday May 11 at 7 p.m. Annual general meeting.

Canadian Figures

Consumption of all rubber (natural, synthetic and reclaimed) in Canada in February was steady compared with February 1959. Consumption amounted to 10,355 long tons (10,367). This brought January-February consumption to 19,985 long tons, a rise of 2.5% from a year earlier.

February consumption of natural declined to 3,570 long tons (3,706) and synthetic to 5,163 (5,173), while reclaimed increased to 1,622 (1,488).

Producers at the beginning of February had 6,929 tons of all kinds of rubber. Production during the month amounted to 13,470 tons: 12,916 tons of synthetic and 554 tons of reclaimed, and on hand at end of the month were 7,404 tons. Production of synthetic and reclaimed in the first two months amounted to 26,502 tons, comprising 25,512 tons of synthetic and 990 tons of reclaimed.

Company in the News

US Rubber

Calling the business pessimism of the past few months unwarranted, Mr John W. McGovern, president of the United States Rubber Company, told the annual meeting of stockholders that he expects new records in both sales and earnings this year. Sales should total more than $1,000m., while earnings should reach between $5.50 and $6 a share. For the first quarter of 1960, Mr McGovern said, sales approximated $254m. and earnings about $1.50 a share, compared with $249m. and $1.55 in the first quarter of 1959.

Mr McGovern said the main buoying factor in his industry was the increasing number of automobiles in use. United States Rubber is confident that the industry will sell at least 15% more tyres for new cars than last year, while there should be a new record demand of 68 million replacement passenger automobile tyres.

Toy rocking horse—called the 'Safety Major' — slush moulded from Geon PVC by Lines Bros. (Ireland) Ltd., Castleraegh. Retail price is £13 13s.

BOOK REVIEW

COMPILATION OF STANDARDS PLASTICS D-20 (1960) — Published by American Society for Testing Materials, Philadelphia. 1,242 pp. £3 15s.

The increase in size of this new—the eleventh—edition reflects the rapidly growing pace of the plastics industry. It contains 213 standards; 22 are new and 23 have been revised or changed in status. In addition to all of the standards prepared by ASTM Committee D-20 on Plastics, the compilation includes selected standards from other committees, which should be of interest to those in the plastics field.

Among the topics covered are specifications for moulding compounds and base materials; standard and moulded shapes; mechanical properties of plastics; effects of radiation; thermal properties of plastics; optical properties of plastics; permanence properties of plastics; analytical methods for plastics; moulds and moulding processes for plastics; definitions and nomenclature of plastics; conditioning of plastics; electrical insulating materials; rubber and rubber-like materials; adhesives and colour and gloss tests.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London S.E.1.

New BTR Boot

A new protective rubber boot—the Steelex—is announced by the footwear division of BTR Industries Ltd. Said to be the first industrial rubber boot manufactured with an external steel toe-cap, the 'visible safety' provided gives the wearer complete confidence in his foot protection. The toe-cap is designed to withstand a 150 ft. lb. blow and conforms to BS953, Grade 1.

The boots are being made with and without spring-steel midsoles and claim to have twice the life of conventional rubber safety boots.

Araldite-based Silver Preparations

Johnson, Matthey and Co. Ltd. announce two additions to the JMC range of thermo-setting silver preparations, both based on Araldite. FSP43 is a surface-coating preparation for application by brushing: FSP49 is a conducting cement: both must be cured at a minimum temperature of 80°C. and will adhere to most materials, including glasses, ceramics, graphites and many plastics. The films are extremely hard, have high electrical conductivities and are highly resistant to water and organic solvents. The film produced by FSP43 can be electroplated in many conventional acid baths.

PATENT LIST

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Badische Anilin- and Soda-Fabrik A.G. Polymerization catlyst and process for the production of polymers. 830,834.

Dayton Rubber Co. Air-spring unit. 831,222.

Agency of Industrial Science and Technology, Ministry of International Trade and Industry of the Government of Japan. Preparation of synthetic fibre-forming polyamides and polyamides prepared thereby. 830,799.

Devoe and Raynolds Co. Inc. Preparation of hydroxyl-containing polymers. 831,056.

United States Rubber Co. Inking rolls. 831,012.

Manufactures De Produits Chimiques Du Nord Etablissements Kuhlmann. Protecting elastomers against atmospheric degradation. 830,914.

T. Mainardi. Process for the manufacture of tubular containers made of plastic material. 831,159.

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P. Lechler and K. Lechler, trading as Lechler O.H.G., P. Apparatus for treating reactive synthetic plastics. 831,019.

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Union Carbide Corporation. Polyolefine resins and a process for their preparation. 831,260.

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Dunlop Rubber Co. Ltd. Resilient mounting. 831,473.

Firestone Tire and Rubber Co. Apparatus and method of manufacturing rubber air springs. 831,543.

NEW COMPANIES

Terrain (Plastics) Ltd. (653,243).—March 21. Capital: £100 in £1 shares. To carry on the business of engineers, founders, moulders, extruders of plastics, smiths, machinists, etc. The directors are: John R. Newman, Wild Acre, Butlers Dene Road, Woldingham; Bernard W. Brixey, 31 Park Drive, East Sheen, S.W.14. Reg. office: 1 Guildhall Chambers, Basinghall Street, E.C.2.

Supersun Plastics Ltd. (653,667).—March 23. Capital: £4,000 in £1 shares. To carry on the business of manufacturers of all kinds of articles in plastic materials, celluloid casein or gelatine, etc. Directors: James W. Reed, Winnie Reed, Ann Blackadder and Brian T. Rigg. Solicitors: Davis and Davis, 3 Laurence Pountney Hill, E.C.4.

Tempered Group Ltd. (653,757).—March 24. Capital: £100 in £1 shares. To carry on the business of manufacturers of springs, pressings, components, tools, moulds and dies, manufacturers, extruders, moulders of rubber or plastic products, etc. The first directors are to be appointed by the subscribers. Reg. office: Warren Street, Sheffield, 4.

Tempered Rubber Components Ltd. (653,758).—March 24. Capital £100 in £1 shares. To carry on the business of manufacturers of springs, pressings, components, tools, moulds and dies, manufacturers, extruders, moulders of rubber or plastic products, etc. The directors are: Gerald F. Young, The Ridge, Sandygate, Sheffield; Charles G. Murray, 545 Fulwood Road, Sheffield; and Hugh Young, 94 Abbeydale Road South, Sheffield. Reg. office: Warren Street, Sheffield, 4.

Freeman and Pardoe Ltd. (653,412). — March 22. Capital: £2,000 in £1 shares. To acquire the business of general engineers and plastic manufacturers carried on by Freeman and Pardoe at 164 Walkwood Road, Hunt End, Redditch, etc. The directors are: William H. Freeman, 8 Holly Grove, Sidemoor, Bromsgrove; William H. Pardoe, 37 Lodge Road, Redditch; Eddie J. Hancock, 6 Middlefield Road, Bromsgrove. Reg. office: 4 Church Green East, Redditch, Worcs.

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Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

VEXAR (795,239) Materials and articles included in Class 16, all of plastics and being for wrapping and packaging purposes. E. I. Du Pont de Nemours and Co., 1007 Market Street, Wilmington, State of Delaware. Address for service is c/o Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2. (Class 16; March 1 1960).

COREPHEN (790,811) Synthetic resins and adhesives, all for use in industry. Farbenfabriken Bayer Aktiengesellschaft, Bayerwerk, Leverkusen (22c). Address for service is c/o Carpmaels and Ransford, 24 Southampton Buildings, Chancery Lane, W.C.2. (Class 1; March 1 1960).

WEYLITE (788,729) Synthetic resins for use in manufacture. Michael George Hope and Frederick George Lambert, trading as M. G. Hope and Partners, 57 Hereford Road, Feltham, Middlesex. (Class 1; March 1 1960).

BRIDGESTONE (791,550) Tyres and inner tubes therefor, all for vehicles. Bridgestone Tire Kabushiki Kaisha, No. 1, 1-Chome, Kyobashi, Chuo-Ku, Tokyo, Japan. Address for service is c/o Eric Potter and Clarkson, 317 High Holborn, London, W.C.1. (Class 12; March 1 1960).

SEMPERIT

(785,409) Aeronautical balloons and parachutes; brake linings, buffers and springs of rubber, and tyres and inner tubes therefor, all for vehicles; handle bars and saddles, all for pedal and motor cycles; and patching material (other than cement or rubber solution) for vehicle tyres. Semperit Osterreichische-Amerikanische Gummiwerke Aktiengesellschaft, Helferstorferstrasse 9-15, Vienna, Austria. Address for service is c/o G. F. Redfern and Co., 15 Dominion Street, London, E.C.2. (Class 12; March 8 1960).

SERVILON (796,255) Sheet materials made from polyvinyl chloride plastics included in Class 17 and bonded by fibrous materials. The Servitor Textiles Ltd., Moorside Mill, Moorside, Oldham, Lancashire. (Class 17; March 1 1960).

SCENTINEL SNUG (783,098). Draught excluders wholly or principally of rubber or of plastics. New Hygiene Ltd., 266-268 Holloway Road, London, N.7. (Class 17; March 1 1960).

DIXIE (B760,141) Carbon black used for industrial purposes. United Carbon Co., Inc., Broad Street and Kanawha Boulevard, Charleston, West Virginia, USA. Address for service is c/o Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London, W.C.2. (Class 1; March 8 1960).

POLASTOR (793,784) Synthetic resins for use in manufactures. Astor Boisselier and Lawrence Ltd., 1 Lancaster Place, London, W.C.2. (Class 1; March 8 1960).

RILSTIK (795,806) Adhesives (not being stationery). Rubber Improvement Ltd., Rilex House, 2 Chandos Street, London, W.1. (Class 1; March 8 1960).

PLASMINIUM (797,121) Laminates of aluminium and plastics, in the form of strips and sheets, the aluminium predominating. Willmott Tavlor Ltd., Wharfdale Road, Tyselev, Birmingham, 11. (Class 6; March 8 1960).

INFINILITE (797,143) Plastics in the form of sheets and shaped pieces, all included in Class 17. The General Electric Co., Ltd., Magnet House, Kingswav, London, W.C.2. (Class 17; March 8 1960).

INFINILITE (797,144) Plastics in sheet form for use in building construction. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. (Class 19; March 8 1960).

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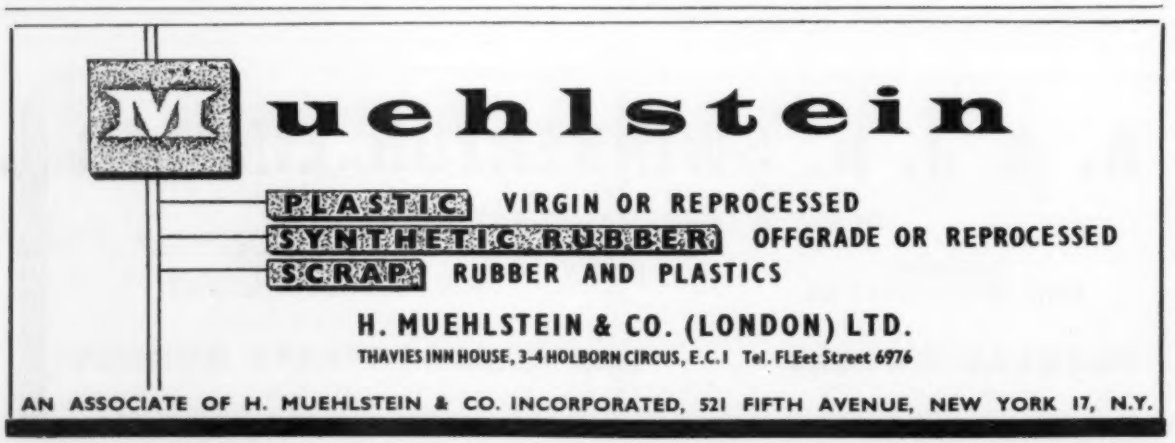
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